Carlson Takeoff R6

Carlson Software Inc.

User’s manual

July 27, 2012

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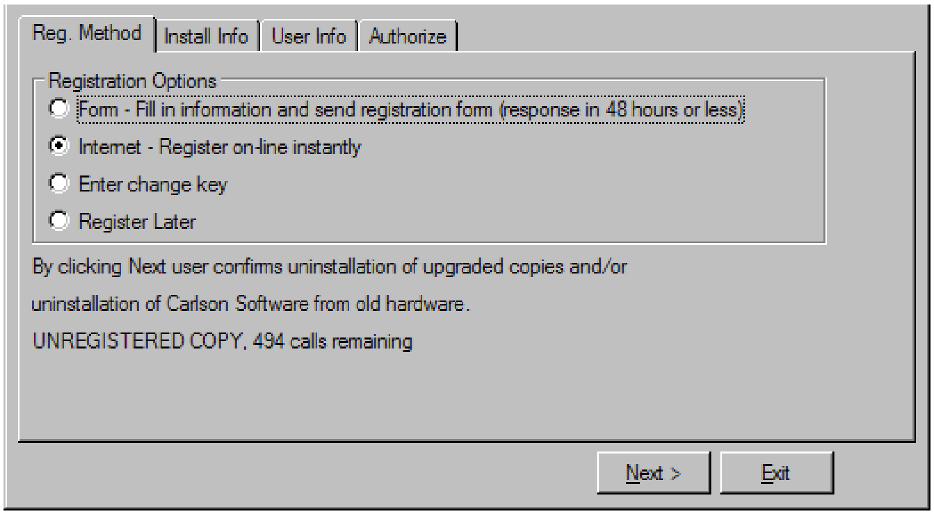
Introduction

1

Carlson Registration

Each Carlson program is licensed for use on **one** workstation which must be registered. The registration records your company name, Carlson serial number and AutoCAD serial number. To register your copy of Carlson, start Carlson and choose "Register Now". The following dialog will appear.

Note: Carlson Software will no longer issue change keys over the telephone. There are four registration options.



Registration Options

○ Form - Fill in information and send registration form (response in 48 hours or less)

● Internet - Register on-line instantly

○ Enter change key

○ Register Later

By clicking Next user confirms uninstallation of upgraded copies and/or uninstallation of Carlson Software from old hardware.

UNREGISTERED COPY, 494 calls remaining

Fax: This method allows you to print out the required information on a form which you then fax to Carlson Software. The fax number is printed on the form. The change key will be faxed back to you within 72 hours.

Internet: Register automatically over the Internet. Your information is sent to a Carlson Software server, validated and returned in just a few seconds. If you are using a dial-up connection, please establish this connection before attempting to register.

Enter pre-authorized change key: If you originally chose the Fax method above, you will need to choose this method now to enter the change key that is faxed back to you.

Register Later: If you wish, you may defer registration up to 30 days. After this time, Carlson will enter demo mode which displays a message each time a Carlson command is run.

After you select the registration method, choose Next and select the type of installation you are performing, choose Next again to review the copyright information and to fill out the required information. At this point, if you are using the Fax method, press the Print Fax Sheet button. If you are registering using the Internet method, press Next and the process will start.

If you have any problems with Internet registration, please repeat this process and use the Fax method. The registration form is available on the Carlson Software website at http://www.carlsonsw.com/registration.html.

Tip: If Carlson is running, you may access the registration dialog by choosing *About Carlson* from the Help menu, then pick the Change Registration button.

Obtaining Technical Support

via Discussion Groups

- Carlson Software operates user discussion groups located at news://news.carlsonsw.com. You can participate in user-to-user discussions on tips, tricks and problems. Our staff monitors these groups to ensure that all the issues are addressed. Visit our website at http://www.carlsonsw.com for information on how to access these groups.
- You may also access the Carlson Software Knowledge Base. Visit it directly at http://update.carlsonsw.com/kbase_main.php.

via Electronic Mail

- The Technical Support e-mail address is support@carlsonsw.com.

via Phone/Fax

- Phone: (606) 564-5028
- Fax: (606) 564-6422

via Web Site

Check the Carlson Software web site at http://www.carlsonsw.com for:

- Knowledge Base, discussion groups, technical support documents and newsletters
- Carlson Software manuals (PDF) and training movies
- Training and seminar schedules
- Step by step procedures on popular called-in topics
- Carlson Software and Autodesk downloads and updates (Feel free to register for automatic update notification of updates when you come to that area.)

via Training

- Basic, advanced and update training is available from Carlson College. Enroll on our webpage or call 606-564-5028 and ask for Carlson College.

Setting Up a Project

Over 200 program settings can be specified in the Configure command under the Settings menu. These values are used to initialize Carlson program options when opening a new or existing drawing. Among these settings is the coordinate point number format, file and printer output options and settings for each module.

To set the drawing defaults, edit the template drawing (.DWT file). This drawing is loaded when new drawings are created. In the template drawing you can set the layers and AutoCAD /IntelliCAD variables. For example you could create your standard layers and set variables as you like such as BLIPMODE off. For Carlson, the drawing template should be set to Carlson##.dwt where the ## is the AutoCAD version number. For Carlson running in AutoCAD 2007, the template name is Carlson07.dwt. The Carlson template is located in the Carlson support directory (i.e. C:\Carlson2008\SUP\Carlson07.dwt). To customize the template, run the *OPEN* command and choose the drawing template. In the Select File dialog, set the type of file to Drawing Template (DWT) instead of regular drawings (DWG). Then make your changes and *SAVE* the drawing as Carlson##.dwt.

When starting a new drawing, one of the first steps is to run Drawing Setup under the Settings menu. Drawing Setup sets the drawing scale, the unit mode as either English or metric, and the text, symbol and linetype size scalers. The initial values for these Drawing Setup variables are set in Configure. When a drawing is saved, the Drawing Setup variables are saved with the drawing.

In Carlson, the text style height should be set to zero. The Carlson routines will set the text height according to the drawing scale and text size scaler set in Drawing Setup. For example, if the horizontal scale is set to 50 and the text size scaler is 0.1, Carlson will draw the text with a height of 5 ($50 * 0.1$). Then when the drawing is plotted at 1"=50', the text will be 0.1 inches. Use the *STYLE* command to set the text style height to zero.

The Set Data Directory command in the Settings menu can be used to specify the directory for the project data files. By default the drawing is stored in the Carlson WORK directory and the data files are stored in the DATA directory. The drawing file is the (.DWG) file. The data files are the coordinate (.CRD) file, profile (.PRO) file, grid (.GRD) file and other Carlson data files. In Configure>Project/Data Folders, there is an option to store all data files in the directory of the drawing. With this option active all the files for the drawing C:\Carlson2008\Work\JOB500\JOB500.dwg would be stored in C:\SCAD2006\WORK\JOB500.

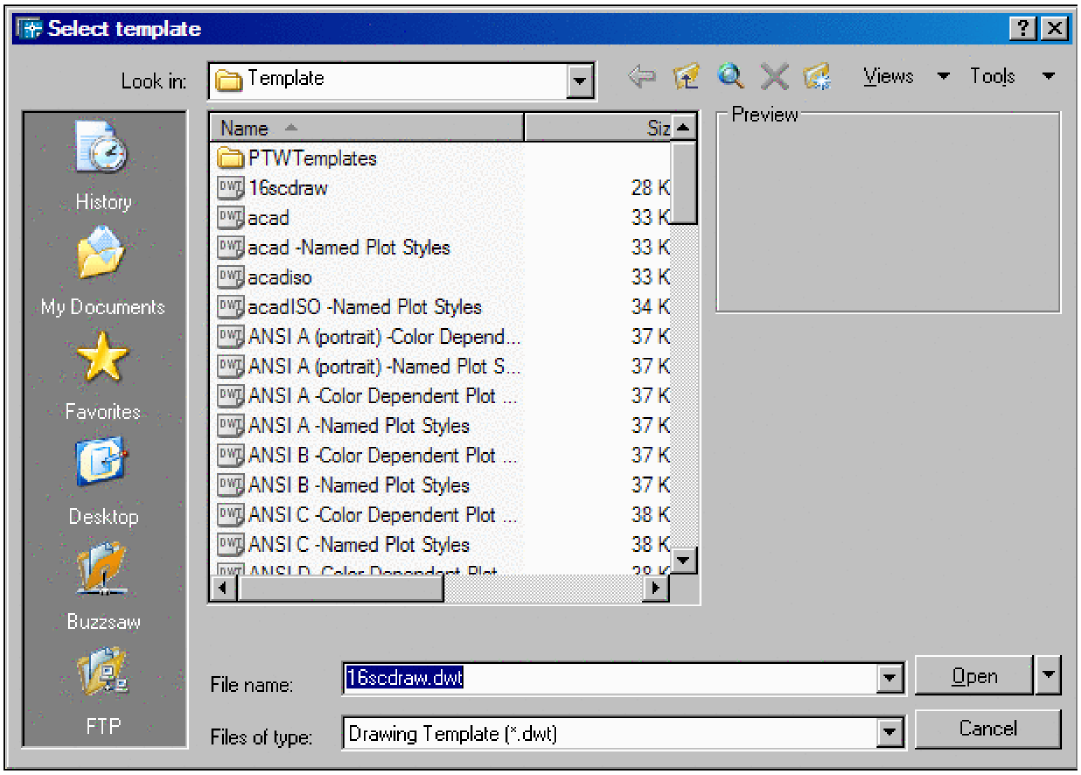
Another level of file management is the automatic project file recall. Every drawing remembers the data files that are being used for the drawing. When the drawing (.DWG) file is saved with the SAVE, SAVEAS, or QSAVE command, Carlson writes a settings file that contains all the active data file names. Then when the drawing is reopened, the data files default to their previous settings. For example, you won't have to choose which coordinate file to use unless you want to change it. The settings file is stored in the same directory as the drawing file and has the same name as the drawing with a .INI extension. For example, a drawing survey.dwg would have a settings file called survey.ini. You can turn off the INI files with the Save Drawing INI Files option in Configure under General Settings.

New/Startup Wizard

The New command is used for starting a new Carlson drawing. This page describes this New command and the Startup Wizard, along with the Carlson variables, associated with it.

Built into this routine is a Startup Wizard that can step you through and make the new Carlson drawing setup process easier. For creating a new drawing in Carlson, the Startup Wizard guides you through starting and setting up the drawing. This wizard is optional, and can be turned on or off in the Configure > General Settings command, which is part of the File pulldown. There is also a dialog box option, shown and mentioned below, that allows you to disable this feature. You can also exit out of the Startup Wizard at any time.

When the *New* drawing command is executed, you first get the standard Select template dialog box. While there are many templates to choose from, and there is an Open option, typically you want to go with choosing the Carlson drawing template (CARLSON07.DWT). The drawing template will set of some basic drawing parameters such as default layer names.



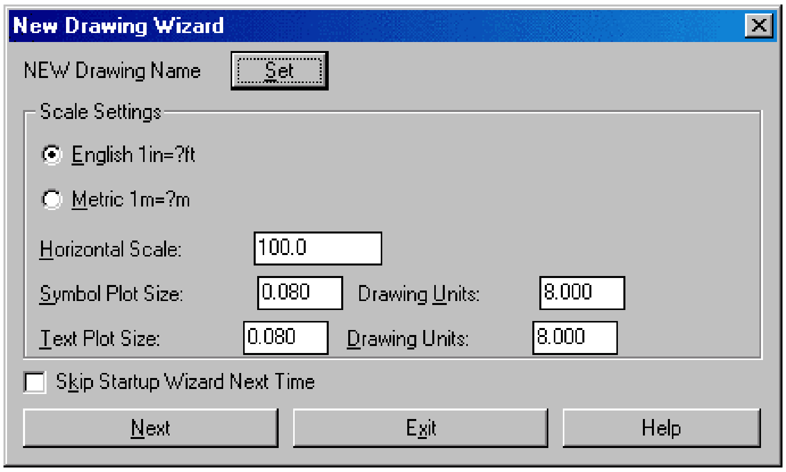
Look in: Template

Name	Siz
PTWTemplates	
16scdraw	28 K
acad	33 K
acad -Named Plot Styles	33 K
acadiso	33 K
acadISO -Named Plot Styles	34 K
ANSI A (portrait) -Color Depend...	37 K
ANSI A (portrait) -Named Plot S...	37 K
ANSI A -Color Dependent Plot ...	37 K
ANSI A -Named Plot Styles	37 K
ANSI B -Color Dependent Plot ...	37 K
ANSI B -Named Plot Styles	37 K
ANSI C -Color Dependent Plot ...	38 K
ANSI C -Named Plot Styles	38 K

File name: 16scdraw.dwt

Files of type: Drawing Template (*.dwt)

After selecting the template, the Carlson Startup Wizard begins by opening the *New Drawing Wizard* dialog box.



● English 1in=?ft

○ Metric 1m=?m

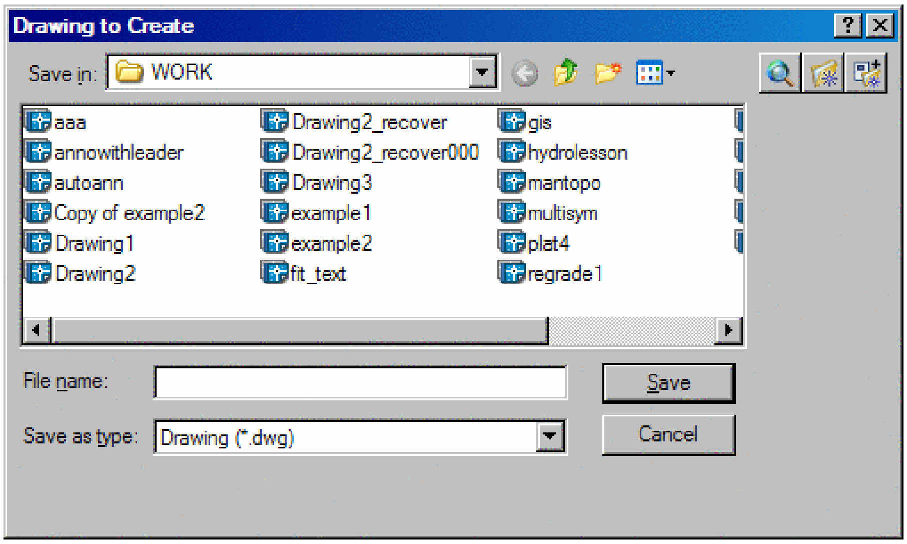
Horizontal Scale: 100.0

Symbol Plot Size: 0.080 Drawing Units: 8.000

Text Plot Size: 0.080 Drawing Units: 8.000

☐ Skip Startup Wizard Next Time

This dialog is used to set the drawing name and scale. The first step to do is set the drawing (.DWG) name by picking the *Set* button. This brings up the file selection dialog. Change to the directory/folder ("*Save in*" field) where you want to store the drawing. You can either select an existing folder or create a new folder. To select an existing folder, pull down the *Save in* field to select a folder or drive, click the Move Up icon next to the *Save in* field and/or the pick the folder name from the list. To create a new folder, pick the Create New Folder icon to the right of the Save in field. Then type in the drawing name in the *File name* field and click the *Save* button.



Save in: WORK

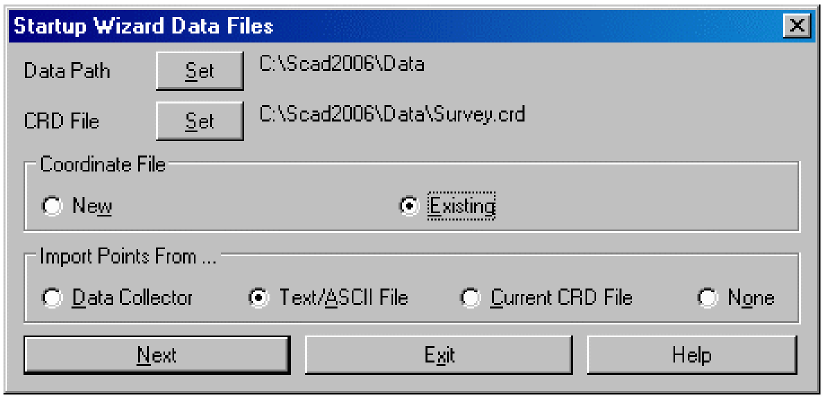
aaa
annowithleader
autoann
Copy of example2
Drawing1
Drawing2
Drawing2_recover
Drawing2_recover000
Drawing3
example1
example2
fit_text
gis
hydrolesson
mantopo
multisym
plat4
regrade1

File name:

Save as type: Drawing (*.dwg)

After setting the drawing name, you can set the drawing horizontal scale, symbol size, text size and unit mode (English or Metric). Notice that at the lower left corner of the *New Drawing Wizard* dialog there is an option to Skip Startup Wizard Next Time. Typically, you would leave this option unchecked, as the Wizard is a handy tool for new drawing setup. Now click the Next button.

The next startup dialog sets the Data Path and CRD File. The Data Path is the folder where Carlson will store the data files such as raw (.RW5) files and profile (.PRO) files. The *Set* button for the Data Path allows you to select an existing folder or create a new folder. See the Set Data Directory command for more information. The coordinate (.CRD) File is the coordinate file for storing the point data. There is an option to create a new or existing coordinate (.CRD) file. The new option will erase any point data that is found in the specified CRD file. The existing option will retain any point data in the specified coordinate (.CRD) file. If the specified coordinate (.CRD) file does not exist, the wizard will create a new file.


Startup Wizard Data Files

Data Path C:\Scad2006\Data

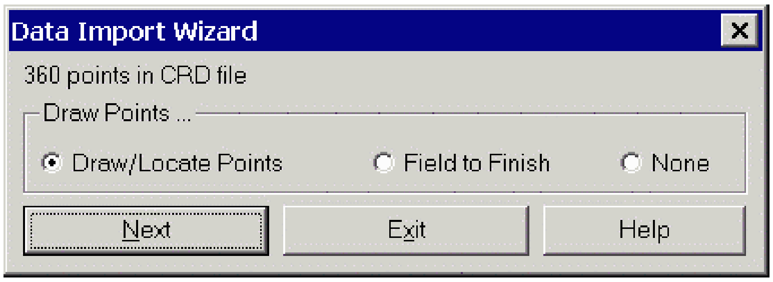
CRD File C:\Scad2006\Data\Survey.crd

Coordinate File: ○ New ● Existing

Import Points From ...: ○ Data Collector ● Text/ASCII File ○ Current CRD File ○ None

The next wizard step depends on the Import Points option. The Data Collector option will start the data collection routines to download data from a collector. The Text/ASCII option will import point data from a text/ASCII file. See the Data Collection and Import Text/ASCII File commands for more information on running these routines. The Current CRD File option is a popular one to choose for bringing in coordinates. If the None option is set, then the Startup Wizard is finished.

Once point data has been imported from the data collector, text/ASCII file or CRD file, the wizard guides you through drawing the points. There are options to run Draw/Locate Points, Field To Finish or None. If None is selected, then the Startup Wizard is finished. Draw/Locate Points will import the points into the drawing using the same symbol and layer for all the points. From the Draw/Locate Points dialog, set the symbol, layer and point attributes to draw (description, elevation) and then pick the Draw All button. The Field To Finish command will import the points into the drawing using different layers and symbols depending on the point descriptions that refer to the code table defined in Field to Finish. Also Field to Finish can draw linework. See the Draw/Locate Point and Field To Finish commands for more information on running these routines. After drawing the points, the wizard will zoom the display around the points. Then the wizard is finished.


Data Import Wizard

360 points in CRD file

Draw Points ...: ● Draw/Locate Points ○ Field to Finish ○ None

Pulldown Menu Location: File
Keyboard Command: new
Prerequisite: None

Command Entry

Commands may be issued by selecting a pulldown menu, screen menu, digitizer tablet item, or by typing a command at the command prompt. Pulldown menus have a row of header names across the top of the screen. Selecting one of these header names displays the possible commands under that name. Screen menu items are shown in the screen menu (typically on the right side of the screen). The screen menu can be toggled off and on inside of the AutoCAD Options dialog. The Pulldown menus are the primary method for Carlson command selection. Each section of this manual shows the pulldown menu which contains the commands that are explained in that section. Pulldown menus are sometimes also referred to as dropdown menus.

Command availability depends on which menu is loaded. Carlson menus have a mixture of both Carlson and CAD commands. This allows you to execute the commonly used CAD commands from the menus while running Carlson.

Quick Keys are user-defined short cut names that can be typed in to start commands. To review the current set of

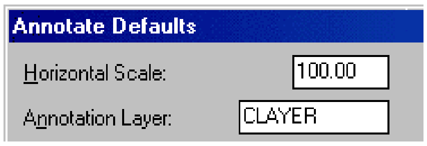
Quick Keys, run the Quick Keys command in the Settings pulldown menu. Quick Keys are explained in more detail in the next section.

For command entry at the Command: prompt, pressing Enter repeats the last command. Also the prompt history records the sequence of previous commands, and you can run these previous commands without invoking the menu. To access the commands, use the keyboard up and down arrows. The up arrow moves backwards in the history and the down arrow moves forward. As you press the arrows, the previous command names appear at the command prompt. When you get to the command that you want to run again, press Enter.

Layer and Style Defaults

Many Carlson commands have default layers such as AREATXT for area labels and BRGTXT for bearing and distance annotations. These layers can be specified in dialogs for the corresponding commands and several can be set in Configure. Sometimes you may want to use the current layer and it can be an extra step to have to open the dialog to set the layer. In this case, instead of using the default layer that set in the dialog, the default layer can be set as "CLAYER" which will use the current layer. For example, if the annotation layer is set to CLAYER then annotation will be drawn in the current layer instead of BRGTXT or whatever the annotation layer used to be.

This same concept applies for text styles. Several commands have specific text styles and if you want to use the current style instead of the command style, use the name "CSTYLE" for the style name.



Horizontal Scale: 100.00
Annotation Layer: CLAYER

Carlson File Types

.AAN Auto-Annotate Settings
.ADF Annotation Default Settings
.ARX AutoCAD Runtime Extension For Carlson Program
.ATR Strata attribute definitions
.AVG Mining Composite Quality Analysis
.BLK Mining Block Model
.CAL Mining equipment calendar
.CAP Capacity file for hydrology (stage-storage)
.CDF Geology Channel Sample File Format
.CDS MDL Laser Raw Data
.CDT Mining custom date table
.CFG Configure Configuration Settings
.CFZ Cut/Fill Color Map Zones
.CGC C&G Coordinate File
.CGR C&G Raw Data
.CH Corehole definition
.CL Centerline file
.CLT Culvert Settings
.CN Hydrology CN Factors
.COG Cadvantage Coordinate Data
.COT Multiple Outlet Design Data
.CQT Mining custom quantity table
.CRB Template Curb Definition
.CRD Coordinate file (point#, northing, easting, elevation, description) in binary form

.CTL SDMS Format Raw Data
.CTR Auto-Run Strata Isopach Maps
.CUI Customized User Interface AutoCAD Menu
.CUT SMI Format Cutsheet
.CVT SEDCAD Format Hydro Network
.DAT GPS Localization Definition
.DCF Deed Correlation File
.DCL Carlson dialogs
.DEM Digital Elevation Model
.DEQ Drillhole equations
.DHF Drillhole Text File
.DHT Dragline History
.DIL StrataCalc Convert As-Determined Qualities
.DLL Carlson programs files
.DTF Drillhole Data Format
.DTS Drillhole Text Settings
.DWG Drawings
.DXF Drawing Exchange Format
.DZR Dozer Push Settings
.EQO Mining equipment options
.EQU Mining equipment definitions
.ERD Erodible Channel Settings
.EW Earthwork Section End Areas
.EXE Carlson programs
.FCL Feature Code List for SurvCE
.FEN Fence Diagram Settings
.FLD Field to Finish code definitions
.FLT Triangulation mesh
.FMS Report Formatter Settings
.FRM Ferm Codes
.GCL Geologic Column Settings
.GEO Settings for Draw Geologic
.GFU Grid File Utilities macro command recorder file
.GIS GIS prompting definitions for note files
.GPF Grade Parameter File For Block Model
.GRD Grid file - a DTM surface model
.GRR Lot Edge Grading Rules
.GSQ Grid sequence history file for mining
.H1 Hydrograph
.H2I HEC-2 Water Surface Profile
.HYD Watershed settings
.HZN Horizon code definitions
.IMP Drillhole Import Format
.INI Program user preferences settings
.LAY Layer State
.LEV Level Raw Data
.LGD Annotate Draw Legend definition file
.LOT Lot file for Survey
.LPT Coordinate Transformation Point File
.LQE Least-Squares Measurement Error Settings
.LSP Carlson Lisp programs
.LSQ Least-squares input data
.LSS Localization Settings
.LTD Lot Attribute Definition

.LTN Lot Network Settings
.MAT Materials Library
.MDN Template Median Definition
.MIN Underground Mining Report
.MNC Compiled menus
.MNL Carlson Lisp programs for corresponding menu startup
.MNR Compiled menus
.MNS Compiled menus
.MNU Carlson source menus
.MNX Compiled menus
.MPD Mining Timing Project File
.MPJ Mining project definitions
.MXS Cross section alignment
.NOT Note file - additional descriptions for points in corresponding .CRD file
.OWN Mining Ownership Data
.PAN Mining Underground Panel Data
.PAR Parameters for mining quality compliance
.PAT Hatch Pattern Definitions
.PDD Enter Deed Description data file
.PFF Mining Pit Format File
.PFS Draw Profile Settings
.PHN Modem Settings For Carlson Field
.PIT Mining Pit Parameter File
.PLN Plan view polyline file for Dozer 2000
.PNA Mining panel attributes
.PPQ Polygon Processor Query
.PRE Pre-calculated grids for strata model
.PRF Point Range File
.PRJ Project settings file
.PRO Profile (station, elevation, descriptions)
.PSZ Pipe Size Definitions
.PTA Mining pit attributes
.PVF System Variable Settings
.PVL Sewer Network Plan View Label Settings
.PVS Mining Projection and Ventilation Settings
.RCF Drainage Runoff Library
.RCL Runoff Coefficient Layer Definitions
.RDF Road Design File
.RDN Road Network File
.RDS Roadside Ditch File
.REC Seismic Record Output
.REP Hec-Ras Report File
.RES Mining Auto-Run Residuals Settings
.RME Reame Slope Stability Settings
.RMP RiverMorph Project
.RNF Road Network Stakeout for SurvCE
.ROW Right-of-Way offsets for Lot Network
.RPT Report Formatter Data
.RSV Mining Reserve Description
.RUN Auto-Run Strata Grids definition file
.RW5 Raw file of traverse data
.SC Coal Section Configuration
.SC5 SurvCE Raw Data Archive
.SCR COGO script file

.SCT Cross section data (station, offset, elevation, descriptions)
.SDF Strata Definitions
.SDT SB-Slope Stability File
.SEQ Dragline sequence file
.SEW Sewer network file for hydrology
.SGD Slope Group Definition for Design Pad Template
.SIF Surface Inspector File
.SLB Slide library
.SLD Slide image
.SLI Symbol Library
.SST Draw Section Sheet Settings
.STG Stage-discharge data for hydrology
.STR Sewer Structure Library
.SUP Superelevation file
.TAB Hydrology Peak Flow Data
.TCF Digitizer Tablet Configuration File
.TCH Trench Structure Template
.TIM Mining Timing Settings
.TIN Triangulation Surface
.TKD Takeoff Material Definitions
.TOP Topsoil Definition for Road Design
.TPC Template point centerline definition
.TPL Template file for Section-Profile
.TPP Template point profile definition
.TPT Template transition file for Civil Design
.TRG Takeoff Layer Target Settings
.TRI Triangulate & Contour Settings
.TSF Road Template Series File
.UAO Report Formatter Attribute Options
.UAT Report Formatter User Attributes
.UDP User-Defined Projection For Grid Coordinates
.VOL Auto-Run Strata Quantities definition file
.WST Watershed Structure File
.XML LandXML Data Exchange File
.ZIP Compressed Data Files
.ZON Earthwork Zone Definitions

Standard Report Viewer

Many Carlson routines display output in the Standard Report Viewer as shown below. A project name and job number can be added to the report header by filling out values for them in the Settings->Drawing Setup command. The format for the date in the upper right of the report is controlled by the Date Format setting in Settings->Configure->General Settings. The report can be edited directly in the report viewer. Report Viewer commands are described below.

Open: This allows you to open an ASCII file and display the contents in the report viewer.

Save: Save the contents of the report viewer to a text file.

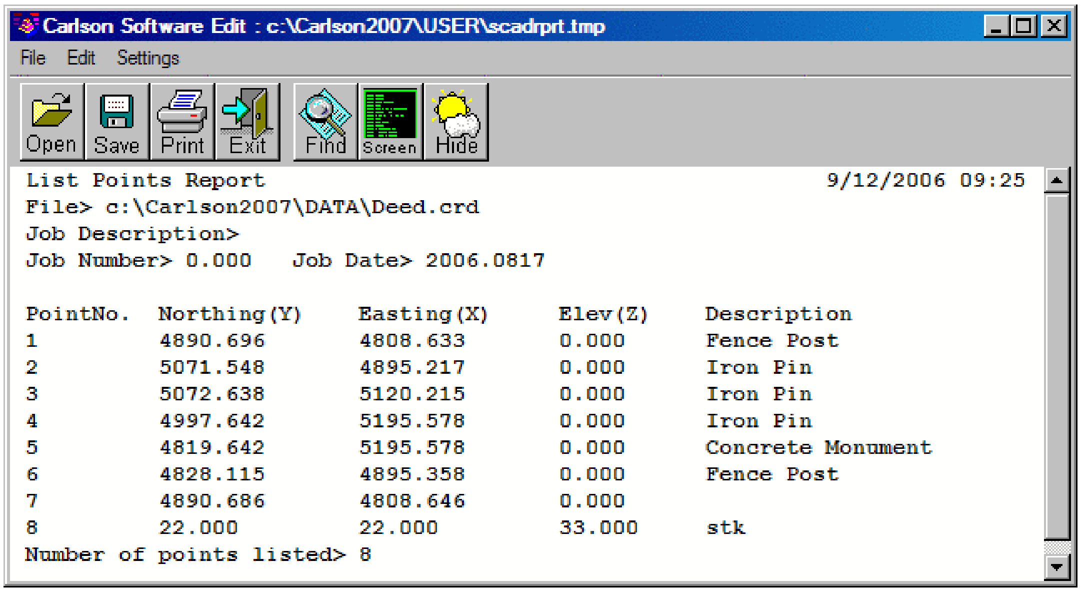
SaveAs: This allows you to save the contents of the report viewer to a file.

Append To: This allows you to append the contents of the report viewer to another file.

Print: Print the contents of the report viewer. This will open the standard windows Print dialog where you can choose the printer and modify any of the printer settings before you actually print.

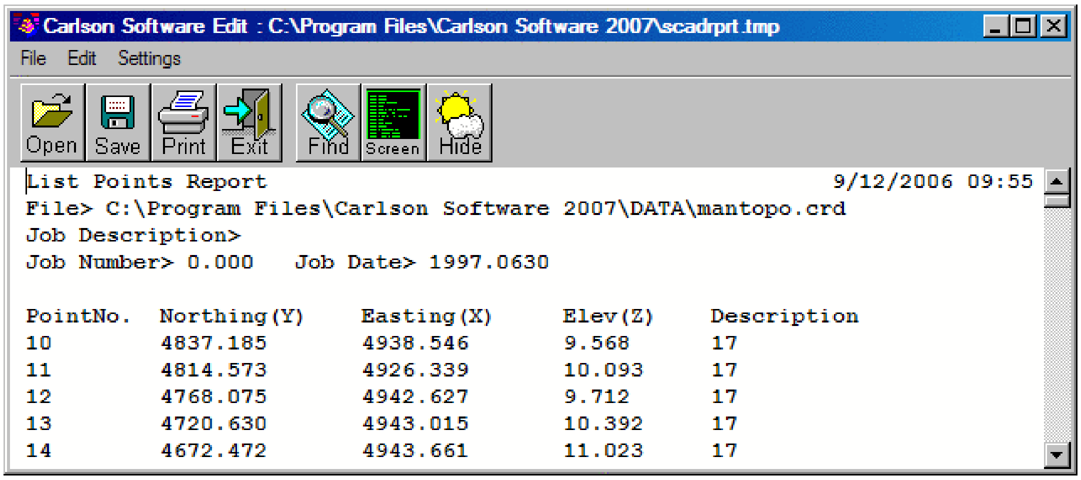
Screen: Draws the report in the current drawing. The program will prompt you for a starting point, text height, rotation, layer and whether you want it inserted as Mtext or Text.

Undo: Reverses the effect of your last action. If you mistakenly deleted some text, stop and choose the Undo command to restore it. The key combination Ctrl+Z also performs this action.


Carlson Software Edit : c:\Carlson2007\USER\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

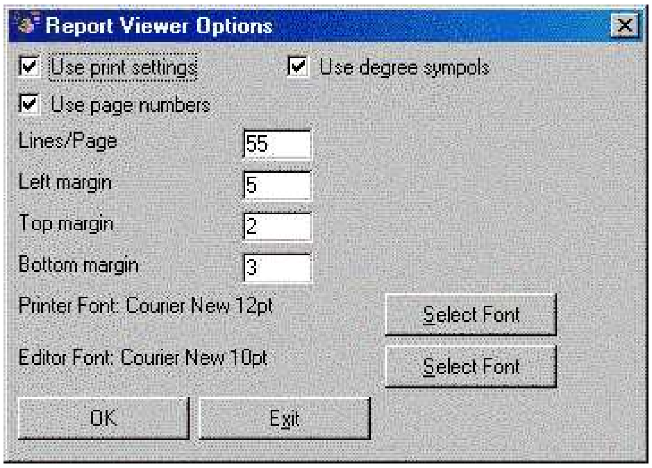
```
List Points Report                                      9/12/2006 09:25
File> c:\Carlson2007\DATA\Deed.crd
Job Description>
Job Number> 0.000   Job Date> 2006.0817

PointNo.  Northing(Y)   Easting(X)    Elev(Z)    Description
1         4890.696      4808.633      0.000      Fence Post
2         5071.548      4895.217      0.000      Iron Pin
3         5072.638      5120.215      0.000      Iron Pin
4         4997.642      5195.578      0.000      Iron Pin
5         4819.642      5195.578      0.000      Concrete Monument
6         4828.115      4895.358      0.000      Fence Post
7         4890.686      4808.646      0.000
8         22.000        22.000        33.000     stk
Number of points listed> 8
```


Carlson Software Edit : C:\Program Files\Carlson Software 2007\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
List Points Report                                      9/12/2006 09:55
File> C:\Program Files\Carlson Software 2007\DATA\mantopo.crd
Job Description>
Job Number> 0.000   Job Date> 1997.0630

PointNo.  Northing(Y)   Easting(X)    Elev(Z)    Description
10        4837.185      4938.546      9.568      17
11        4814.573      4926.339      10.093     17
12        4768.075      4942.627      9.712      17
13        4720.630      4943.015      10.392     17
14        4672.472      4943.661      11.023     17
```



☑ Use print settings ☑ Use degree sympols
☑ Use page numbers
Lines/Page 55
Left margin 5
Top margin 2
Bottom margin 3
Printer Font: Courier New 12pt
Editor Font: Courier New 10pt

Select All: Selects all the text in the report viewer.

Cut: Deletes the selected text and places it on the Windows® clipboard.

Copy: Copies the selected text to the Windows® clipboard.

Paste: Inserts ASCII text from the Windows® Clipboard into the report viewer at the cursor.

Search: Opens the Find Text dialog. Allows you to search for text in the report viewer.

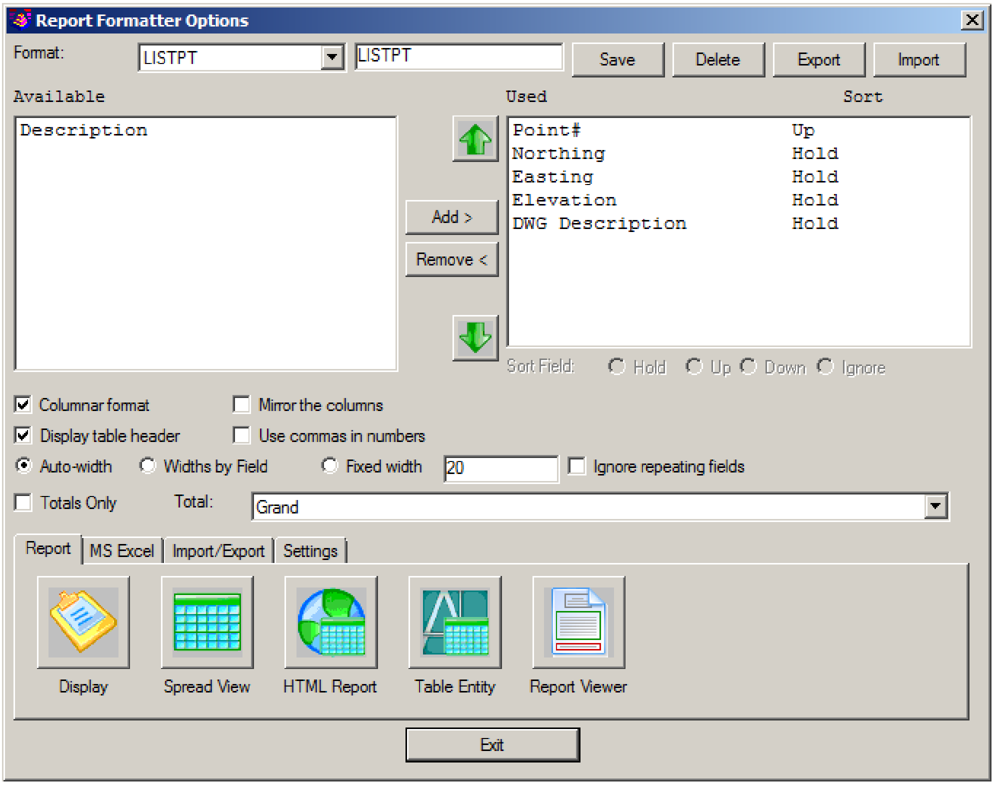
Replace: Opens the Find and Replace Text dialog. Allows you to search for text and replace it.

Options: Opens the Report Viewer Options dialog. In this dialog, you can specify print settings, such as lines per page and margins. You can also specify the font used in the report viewer. This font is used for both the display and for printing.

Hide: This button allows you to minimize the report viewer window and give focus back to the Carlson CAD screen. This allows you to return to working on the Carlson CAD screen without closing the report. You can re-activate the report by picking on the minimized report viewer icon.

Report Formatter Dialog

The Carlson Report Formatter routine is a highly customizable and flexible reporting engine that can be used to create a variety of output document types. A number of Carlson routines provide an option to use Report Formatter Options and allows you to specify how and which results of calculations should be presented in the report. In addition to the Standard Report Viewer, reports can be generated in web-friendly HTML format along with data formats compatible with Microsoft Excel or Microsoft Access.



Report Formatter Options

Format: LISTPT LISTPT

Available

Description

Used	Sort
Point#	Up
Northing	Hold
Easting	Hold
Elevation	Hold
DWG Description	Hold

Sort Field: ○ Hold ○ Up ○ Down ○ Ignore

☑ Columnar format ☐ Mirror the columns

☑ Display table header ☐ Use commas in numbers

● Auto-width ○ Widths by Field ○ Fixed width 20 ☐ Ignore repeating fields

☐ Totals Only Total: Grand

Format: Select an available report format from the list of pre-established report configurations or key-in a new report format name.

Save: Saves the current configuration of the active report format. To save a new version of the format, type in a new name (or use the current name to overwrite old one) and click on the Save button. The next time that you come to the Report Formatter from the same Carlson routine, it will recall this last format. To pick another format, select from list of formats in the left top corner and pick which format to use.

Delete: Removes the current report configuration from the listing of available report formats.

Export: Sends ALL available report formats to an XML-based "formatter style" (∗.FMS) file.

Import: Imports the contents of a previously exported ∗.FMS file.

Control	Action
⇧	Moves the selected report option in the **Used** listing above the preceding entry until it reaches the top of the list.
Add >	Moves the currently selected item from the **Available** listing to the **Used** listing.
Remove <	Removes the currently selected item from the **Used** listing and makes it selectable once again to the **Available** listing.
⇩	Moves the selected report option in the **Used** listing below the following entry until it reaches the bottom of the list.

Report Content Controls

Sort Field: For the selected "field" of data, indicate its sort method:

- **Hold:** The given field is not sorted and prohibits the sorting of subsequent columns.
- **Up:** The given field is sorted in ascending order.
- **Down:** The given field is sorted in descending order.
- **Ignore:** The given field is not sorted and permits sorting for the next column(s).

Columnar Format: When enabled, this toggle groups a given field of data into a column in the report. When disabled, each field of data is placed onto its own row in the report (the report data is output in a single column).

Mirror the Columns: (Suggested for short reports only). When enabled, this toggle transposes columns from the report into rows and vice versa.

Display Table Header: When enabled and exporting the report to an *HTML Report* format, the field "keys" as defined in the "Attribute Options" control are included in the report header.

Use Commas in Numbers: When enabled, this option will insert commas into numeric fields for every three digits.

Auto-width: When enabled, the width of each column is automatically set to be the wider of the column heading or the data contained within the column.

Widths by Field: When enabled, the width of each column established in the Attrib Options control (found in the Settings Tab) is used per field.

Fixed-width: When enabled, specify the width of each column.

Ignore Repeating Fields: When enabled, only the first occurrence of a repeating field is display in the report. Subsequent occurrences of the repeated field (*e.g.* the point description) are suppressed until a different value in the repeating field is encountered.

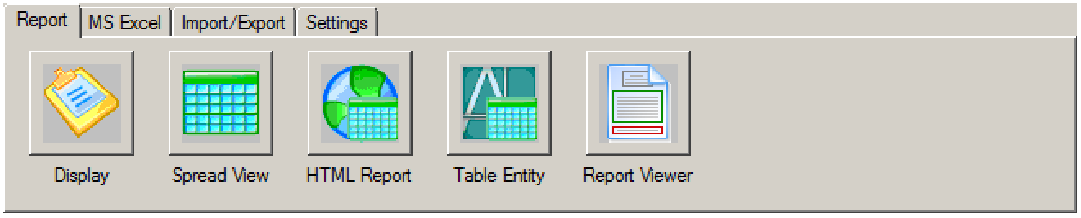
Totals Only: When enabled, only the total of each field is reported.

Total: Select the desired total for the *Used* field(s) of data.

Once the desired fields of data and reporting options have been specified, the output can be generated and manipulated using one of four tabs:

1. Report
2. MS Excel
3. Import/Export
4. Settings

Choose one of the output options:

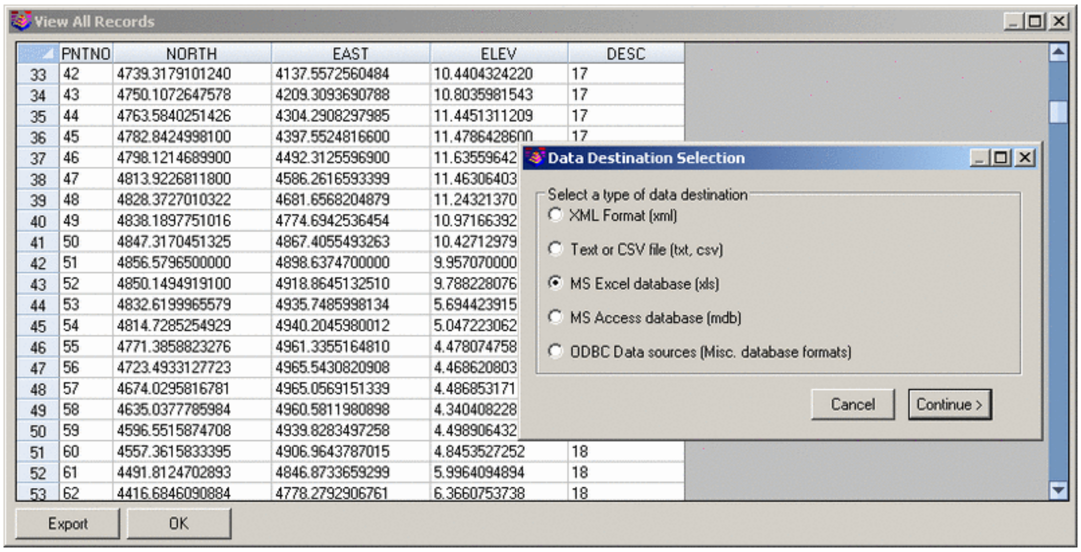


Control	Action
📋	Sends the current report to the Standard Report Viewer command. Upon exiting the Viewer, you come back into the Report Formatter for further data manipulation as needed.
▦	Sends the current report to a "spreadsheet" interface where it can be further exported to a variety of popular file formats. Additional information is provided in the Spreadsheet discussion.
🌐	Sends the current report to an Internet/web-ready HTML file format and displays the report using the HTML viewer that is configured on your computer.
▦	Places the current report as a table-type of entity into the current drawing. Additional information is provided in the Table Entity discussion.

Places the current report into a special-formatted report. Additional information is provided in the Report Viewer discussion.

Report Tab Options

Spreadsheet



View All Records

	PNTNO	NORTH	EAST	ELEV	DESC
33	42	4739.3179101240	4137.5572560484	10.4404324220	17
34	43	4750.1072647578	4209.3093690788	10.8035981543	17
35	44	4763.5840251426	4304.2908297985	11.4451311209	17
36	45	4782.8424998100	4397.5524816600	11.4786428600	17
37	46	4798.1214689900	4492.3125596900	11.63559642	
38	47	4813.9226811800	4586.2616593399	11.46306403	
39	48	4828.3727010322	4681.6568204879	11.24321370	
40	49	4838.1897751016	4774.6942536454	10.97166392	
41	50	4847.3170451325	4867.4055493263	10.42712979	
42	51	4856.5796500000	4898.6374700000	9.957070000	
43	52	4850.1494919100	4918.8645132510	9.788228076	
44	53	4832.6199965579	4935.7485998134	5.694423915	
45	54	4814.7285254929	4940.2045980012	5.047223062	
46	55	4771.3858823276	4961.3355164810	4.478074758	
47	56	4723.4933127723	4965.5430820908	4.468620803	
48	57	4674.0295816781	4965.0569151339	4.486853171	
49	58	4635.0377785984	4960.5811980898	4.340408228	
50	59	4596.5515874708	4939.8283497258	4.498906432	
51	60	4557.3615833395	4906.9643787015	4.8453527252	18
52	61	4491.8124702893	4846.8733659299	5.9964094894	18
53	62	4416.6846090884	4778.2792906761	6.3660753738	18

Data Destination Selection

Select a type of data destination

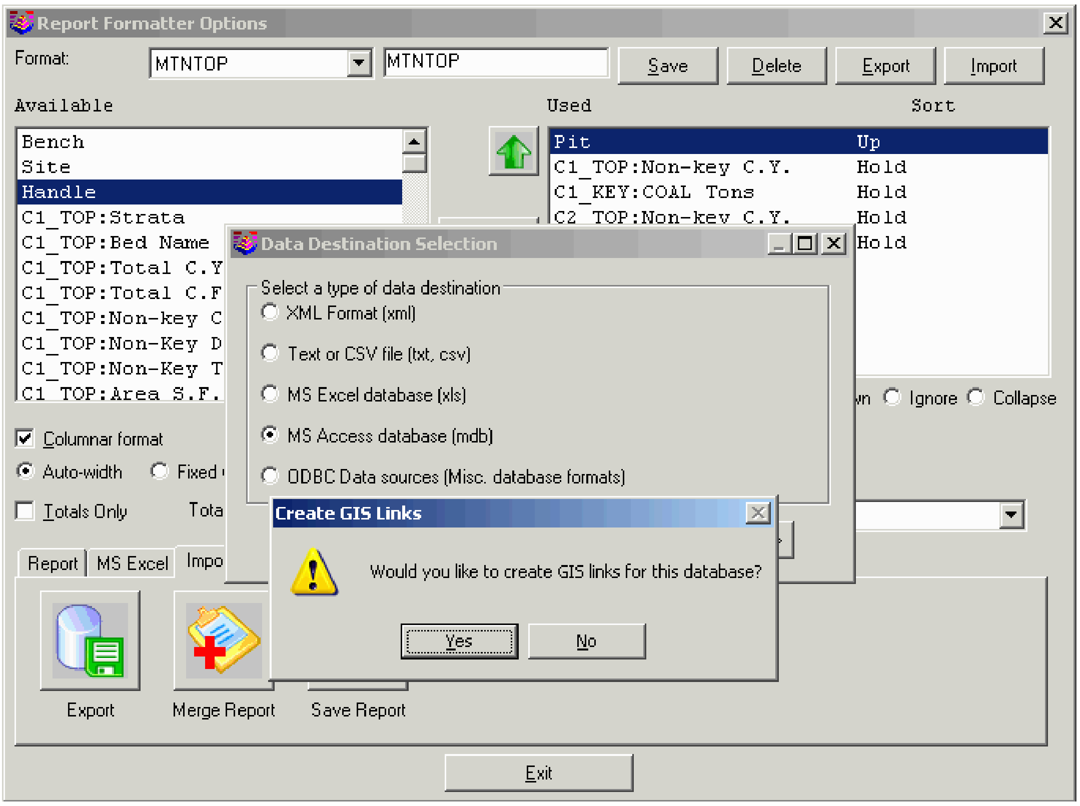
- ○ XML Format (xml)
- ○ Text or CSV file (txt, csv)
- ● MS Excel database (xls)
- ○ MS Access database (mdb)
- ○ ODBC Data sources (Misc. database formats)

Export: This button has the same output options as the Export function under the Import/Export Tab. Use this option to create a variety of popular file formats, including:

- XML Format (xml)
- Text or CSV File (txt, csv)
- MS Excel "database" (xls)
- MS Access database (mdb)
- ODBC Data Sources (Misc. database formats)

For commands that process reports using perimeter polylines, the Report Formatter has an option to create GIS links between the polylines and the database records when the Export to MS Access function is used. Some commands that can utilize this functionality are Surface Mine Reserves with the pit polylines and Underground Timing with the panel polylines.

When the polyline data is available for the GIS Links, there will be a report field called **Handle**. This Handle field is the entity name for the polyline and serves as the hook for the GIS link. The Handle field does not need to be put into the report **Used** list in order to create the links. When the Export function is called with the MS Access method, there is a pop-up window prompt for whether to create the GIS links. When these links are created, you can then use the GIS Data commands from the GIS module to manage and report the data.



Report Formatter Options
Save
Delete
Export
Import
Report
MS Excel
Impo
Export
Merge Report
Save Report
Exit
Data Destination Selection
Create GIS Links
Yes
No

Format: MTNTOP MTNTOP

Available

- Bench
- Site
- Handle
- C1_TOP:Strata
- C1_TOP:Bed Name
- C1_TOP:Total C.Y
- C1_TOP:Total C.F
- C1_TOP:Non-key C
- C1_TOP:Non-Key D
- C1_TOP:Non-Key T
- C1_TOP:Area S.F.

Used	Sort
Pit	Up
C1_TOP:Non-key C.Y.	Hold
C1_KEY:COAL Tons	Hold
C2_TOP:Non-key C.Y.	Hold
	Hold

☑ Columnar format

● Auto-width ○ Fixed

☐ Totals Only Tota

wn ○ Ignore ○ Collapse

Select a type of data destination

○ XML Format (xml)

○ Text or CSV file (txt, csv)

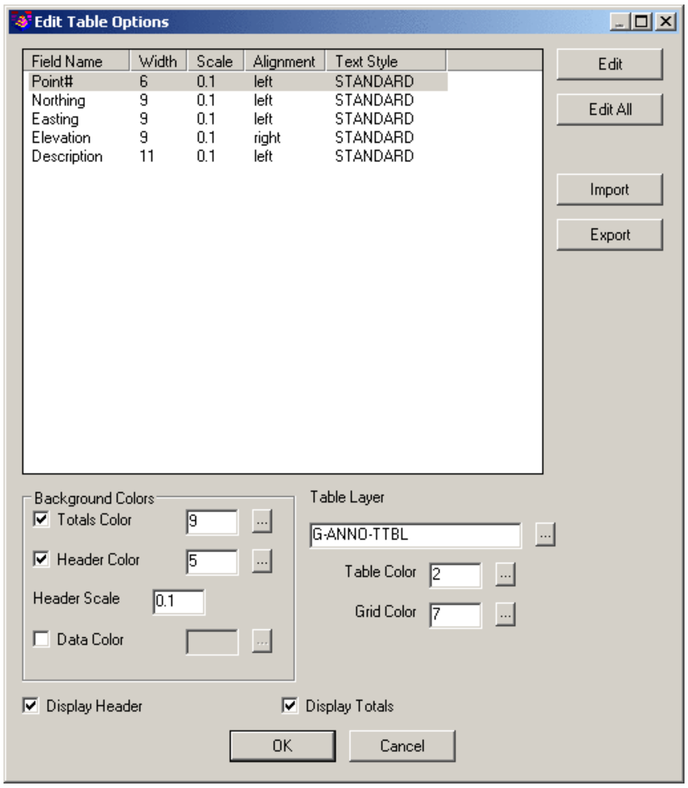
○ MS Excel database (xls)

● MS Access database (mdb)

○ ODBC Data sources (Misc. database formats)

Would you like to create GIS links for this database?

Table Entity



Edit Table Options
Edit
Edit All
Import
Export
...
OK
Cancel

Field Name	Width	Scale	Alignment	Text Style
Point#	6	0.1	left	STANDARD
Northing	9	0.1	left	STANDARD
Easting	9	0.1	left	STANDARD
Elevation	9	0.1	right	STANDARD
Description	11	0.1	left	STANDARD

Background Colors

☑ Totals Color 9

☑ Header Color 5

Header Scale 0.1

☐ Data Color

Table Layer G-ANNO-TTBL

Table Color 2

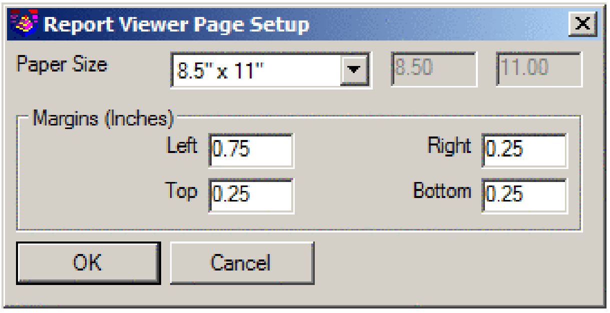
Grid Color 7

☑ Display Header ☑ Display Totals

The data for the Table Entity is put into a queue and the table is not drawn until the Report Formatter is closed. Then the program prompts for a location to draw the table and provides options shown above to control items such as the header names, sizes, alignments, styles, colors and layers. You can also set whether to draw the table header and totals.

Report Viewer

The Report Viewer option provides the ability to produce more professional looking reports that contain horizontal and vertical dividing lines and can also be exported to a variety of common report formats.



Paper Size: 8.5" x 11" 8.50 11.00

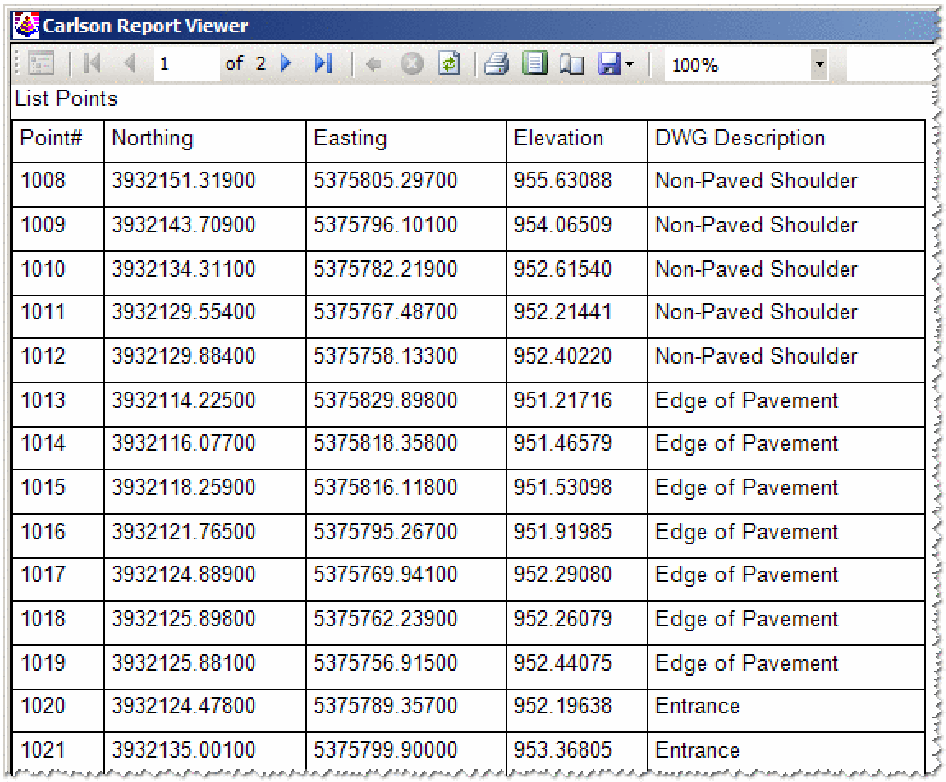
Margins (Inches)

Left: 0.75
Right: 0.25
Top: 0.25
Bottom: 0.25

Indicate the paper size you will be printing to along with desired values for:

- Left Marging
- Right Marging
- Top Marging
- Bottom Marging

Upon specifying the desired values and clicking **OK**, the Report Viewer dialog box will display:



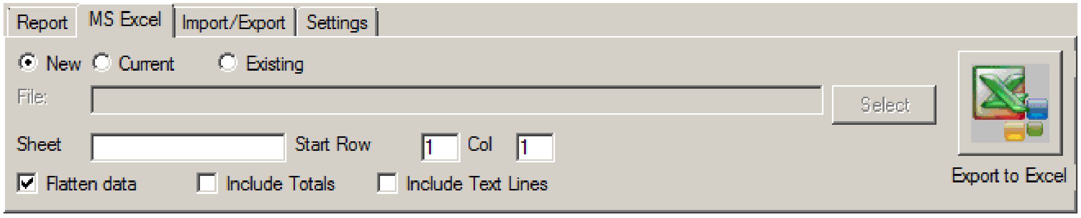
List Points

Point#	Northing	Easting	Elevation	DWG Description
1008	3932151.31900	5375805.29700	955.63088	Non-Paved Shoulder
1009	3932143.70900	5375796.10100	954.06509	Non-Paved Shoulder
1010	3932134.31100	5375782.21900	952.61540	Non-Paved Shoulder
1011	3932129.55400	5375767.48700	952.21441	Non-Paved Shoulder
1012	3932129.88400	5375758.13300	952.40220	Non-Paved Shoulder
1013	3932114.22500	5375829.89800	951.21716	Edge of Pavement
1014	3932116.07700	5375818.35800	951.46579	Edge of Pavement
1015	3932118.25900	5375816.11800	951.53098	Edge of Pavement
1016	3932121.76500	5375795.26700	951.91985	Edge of Pavement
1017	3932124.88900	5375769.94100	952.29080	Edge of Pavement
1018	3932125.89800	5375762.23900	952.26079	Edge of Pavement
1019	3932125.88100	5375756.91500	952.44075	Edge of Pavement
1020	3932124.47800	5375789.35700	952.19638	Entrance
1021	3932135.00100	5375799.90000	953.36805	Entrance

Controls within the report viewer allow you to:

- navigate through the page(s) of information
- refresh the report
- send the report to a printer
- switch between print layout and print preview mode
- re-configure the page setup
- export the report to other document applications
- specify the "zoom" level while displaying the report

- searching the report for a given search criteria


Report
MS Excel
Import/Export
Settings
Select
Export to Excel

● New ○ Current ○ Existing

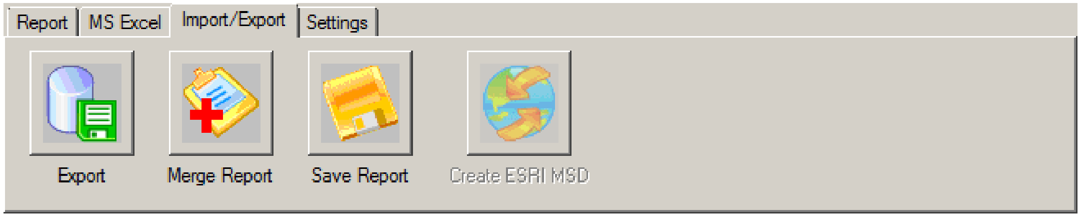
File:

Sheet

Start Row 1 Col 1

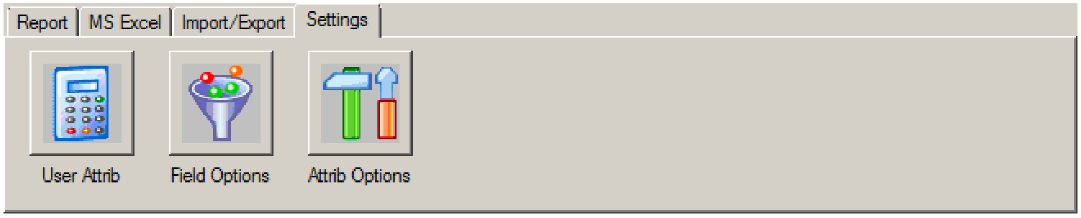
☑ Flatten data ☐ Include Totals ☐ Include Text Lines

Several Microsoft® Excel export options are provided. You may specify a spreadsheet file to load before the export, as well as a left upper cell to start with and sheet name to use. Totals and text lines which are reported when using built-in viewer may be skipped when using Microsoft® Excel export.


Report
MS Excel
Import/Export
Settings
Export
Merge Report
Save Report
Create ESRI MSD

Control	Action
	This button contains the same export options as described in the Spreadsheet discussion.
	This button allows the current report to be combined with a previous report.
	This button saves all the report data values as well as all the report format settings into a single ∗.RPT file that can be shared with others, merged with other reports or loaded at a later time.
	For commands and data that conform to the ESRI Mapping Specification for DWG/DXF (MSD), this button creates an ESRI MSD-compatible report.

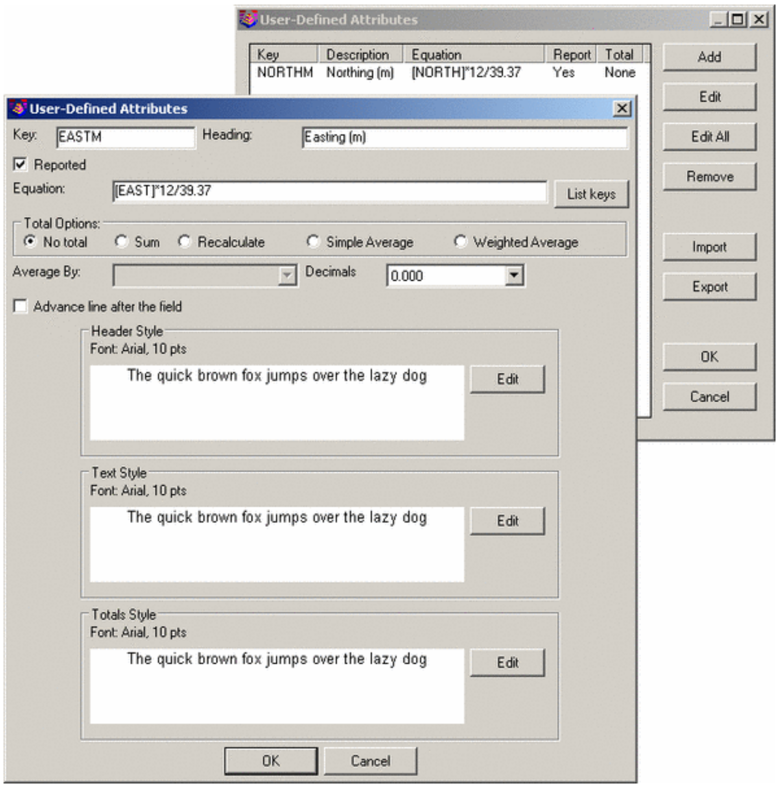
Import/Export Tab Options


Report
MS Excel
Import/Export
Settings
User Attrib
Field Options
Attrib Options

Control	Action
🖩	This option allows you to define new fields as equations based on existing fields. Additional information is provided in the User-defined Attributes discussion.
▽	This option allows you to further customize additional content (*e.g.* Date/Time, Report Name, *etc*) into the report header, body and/or report footer. Additional information is provided in the Field Options discussion.
🛠	This option allows you to control several parameters of each field including title names, number of decimal places, *etc*. Additional information is provided in the Attribute Options discussion.

Settings Tab Options

User-defined Attributes



User-Defined Attributes

Key	Description	Equation	Report	Total
NORTHM	Northing (m)	[NORTH]*12/39.37	Yes	None

User-Defined Attributes

Key: EASTM

Heading: Easting (m)

☑ Reported

Equation: [EAST]*12/39.37

Total Options: ● No total ○ Sum ○ Recalculate ○ Simple Average ○ Weighted Average

Average By:

Decimals: 0.000

☐ Advance line after the field

Header Style
Font: Arial, 10 pts
The quick brown fox jumps over the lazy dog

Text Style
Font: Arial, 10 pts
The quick brown fox jumps over the lazy dog

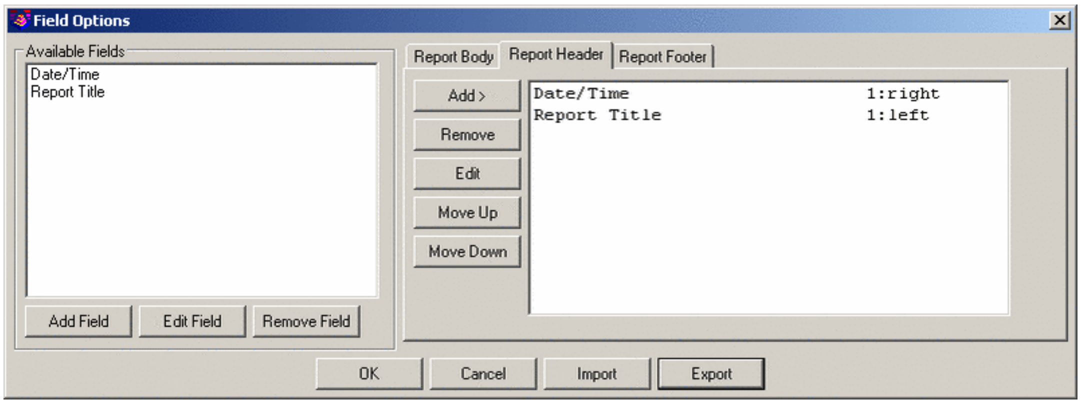
Totals Style
Font: Arial, 10 pts
The quick brown fox jumps over the lazy dog

You can create highly customizable fields of data using parametric equations from other fields of program-generated data... all without the use of an external spreadsheet! User attributes may also have one of the several summation options just like program-generated ones. This feature makes the Report Formatter a very flexible tool for results exploration and reporting.

The summation level is defined by the "Total" pop-up list in the middle of the dialog. By default, only grand total will be displayed at the bottom of the list. By picking the next item in that box, you will get subtotals added each time the value in first column is changed. It makes most sense to use this kind to summation if the corresponding column is sorted.

For example if the first column is "Area Name" and it is sorted, and "Total" is set to "Grand, Area Name" the report will have a sub-total for each distinct Area Name.

Field Options


Field Options
Available Fields
Report Body
Report Header
Report Footer
Add >
Remove
Edit
Move Up
Move Down
Add Field
Edit Field
Remove Field
OK
Cancel
Import
Export

Available Fields:

Date/Time
Report Title

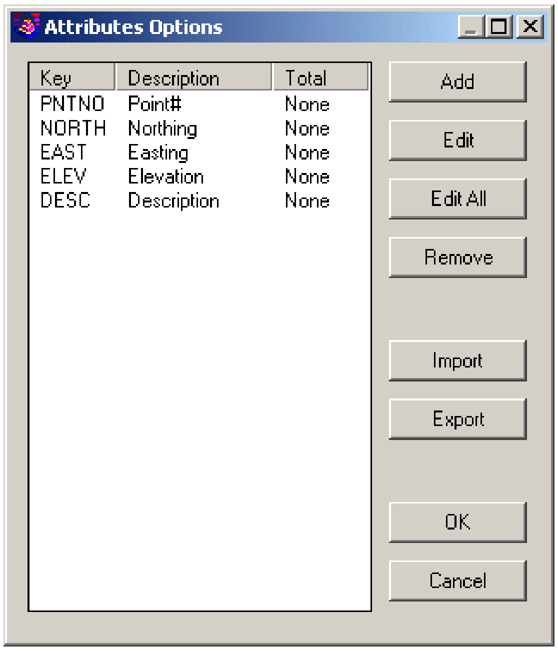
```
Date/Time                         1:right
Report Title                      1:left
```

"Field Options" can be placed into one or more locations within the report:

- Report Header
- Report Body
- Report Footer

Select the desired location for the field and then click on the various controls to add or remove the item from the desired location or change its formatting information.

Attribute Options


Attributes Options
Add
Edit
Edit All
Remove
Import
Export
OK
Cancel

Key	Description	Total
PNTNO	Point#	None
NORTH	Northing	None
EAST	Easting	None
ELEV	Elevation	None
DESC	Description	None

In addition to controlling the user-friendly heading text, you can also indicate totaling methods including:

- Sum
- Simple Average
- Weighted Average

When controlling the number of decimal places, the values can also be rounded up to the nearest integer level such as when earthwork volumes need to be reported to the nearest 1000. There is an option to Advance Line After the Field of the report which inserts a blank row and shifts the next attributes down to a new line in the report. To specify a particular field width, highlight/select the field and choose *Edit* to set the desired field width.

Pulldown Menu Location(s): -various-
Keyboard Command: -various-
Prerequisite: -none-

Instruction Manual and Program Conventions

Westwood
Italic text represent responses by the user that should be typed in and followed by the Enter key.

Number/<Pick point>:
Bold text represents prompts or questions that the computer program will ask the user.

<**90.0000**>
Values enclosed in corner brackets represent default values obtained by pressing Enter with a blank response.

[end on]
Lower case text enclosed in brackets in Command prompts denotes an *OSNAP* mode that is turned on by the command.

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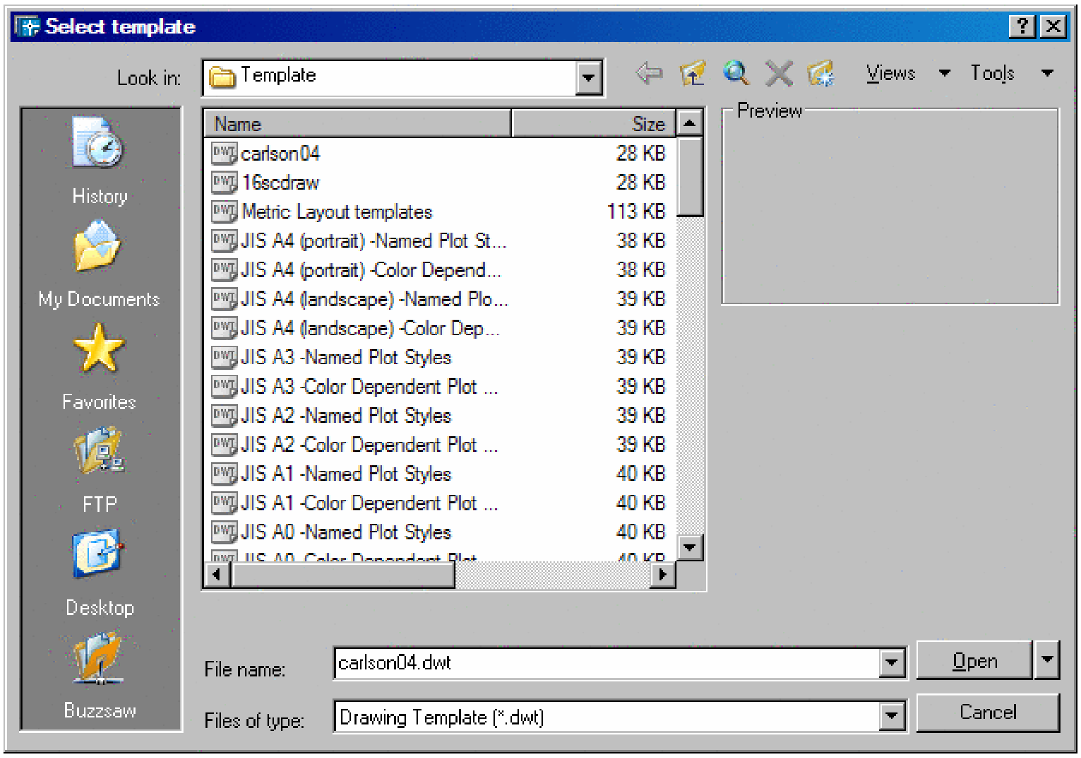
File Menu

2

New

This command allows you to create a new drawing file. This routine defines the settings for a new drawing. You can start a new drawing file by selecting New, and then picking a template file. The first dialog for the New command, called Select Template, lists all template files that currently exist in the drawing template file location. Choose a file to use as a starting point for your new drawing. A preview image of the selected file is displayed to the right.

The template file (.DWT) that you use will depend on the version of AutoCAD or IntelliCAD that you are running. For AutoCAD 2000-2002, the Carlson template file is carlson02.dwt. For AutoCAD 2004, it is carlson04.dwt. For AutoCAD 2005, it is carlson05.dwt. For AutoCAD 2006, it is carlson06.dwt. And for AutoCAD 2008, the Carlson template file is carlson08.dwt. After choosing the template, click the Open button at the lower-right. Next, you will either see the New Drawing Wizard dialog box, or you will be taken to a blank screen. Should you use the wizard, a new drawing name will need to be chosen in order to get to the next step.



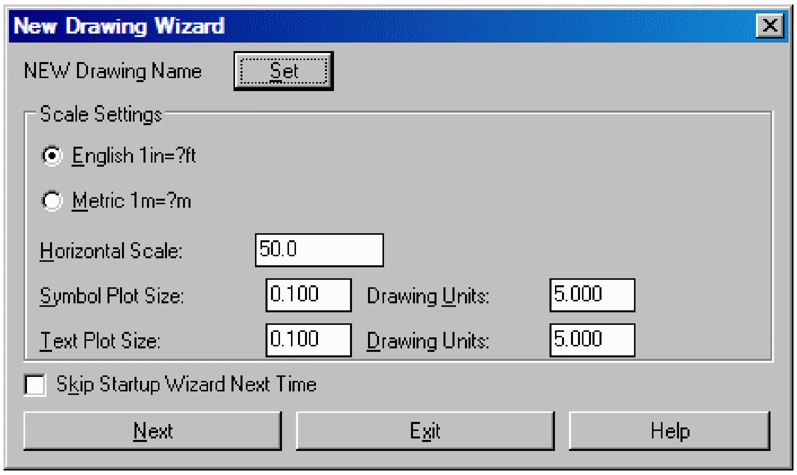
Look in: Template

Name	Size
carlson04	28 KB
16scdraw	28 KB
Metric Layout templates	113 KB
JIS A4 (portrait) -Named Plot St...	38 KB
JIS A4 (portrait) -Color Depend...	38 KB
JIS A4 (landscape) -Named Plo...	39 KB
JIS A4 (landscape) -Color Dep...	39 KB
JIS A3 -Named Plot Styles	39 KB
JIS A3 -Color Dependent Plot ...	39 KB
JIS A2 -Named Plot Styles	39 KB
JIS A2 -Color Dependent Plot ...	39 KB
JIS A1 -Named Plot Styles	40 KB
JIS A1 -Color Dependent Plot ...	40 KB
JIS A0 -Named Plot Styles	40 KB

File name: carlson04.dwt

Files of type: Drawing Template (*.dwt)

If the wizard is in use, the following options will be available to you in the New Drawing Wizard dialog. The New command starts a new drawing using default settings defined in one of the Carlson .DWT template files, depending on the measurement system you've chosen. You cannot modify the surv.dwt or surviso.dwt templates. To start a new drawing based on a customized template, see Use a Template.



NEW Drawing Name

Scale Settings

● English 1in=?ft

○ Metric 1m=?m

Horizontal Scale: 50.0

Symbol Plot Size: 0.100 Drawing Units: 5.000

Text Plot Size: 0.100 Drawing Units: 5.000

☐ Skip Startup Wizard Next Time

English: This option starts a new drawing based on the Imperial measurement system. The drawing is based on the surv.dwt template, and the default drawing boundary (the drawing limits) is 12 × 9 inches.
Metric: This option starts a new drawing based on the metric measurement system. The drawing is based on the surviso.dwt template, and the default drawing boundary (the drawing limits) is 429 × 297 millimeters.

The New command creates a new drawing, using the settings defined in a template drawing you select. Template drawings store all the settings for a drawing and may also include predefined layers, dimension styles, and views. Template drawings are distinguished from other drawing files by the .DWT file extension. They are normally kept in the template directory. Several template drawings are included with Carlson. You can make additional template drawings by changing the extensions of drawing file names to .DWT.

Remember that there are two methods that you can use to work on a Carlson drawing. One is the New command, and the other is the more generic Open command. If you need to open an existing drawing, use Open, also found in the File menu, and then choose an existing file name.

Pulldown Menu Location: File
Keyboard Command: new
Prerequisite: None

Open

This command allows you to open an existing drawing file. Carlson TakeOff displays the Select File dialog box (a standard file selection dialog box). Select a file and click Open.

Prerequisite: None

Keyboard Command: OPEN

Close

This command allows you to close the current drawing. Carlson TakeOff closes the current drawing if there have been no changes since the drawing was last saved. If you have modified the drawing, the program prompts you to save or discard the changes. You can close a file that has been opened in Read-only mode if you have made no changes or if you are willing to discard changes. To save changes to a read-only file, you must use the SAVEAS command.

Prerequisite: None

Keyboard Command: CLOSE

Save

If the drawing is named, Carlson TakeOff saves the drawing without requesting a file name. If the drawing is unnamed, the program displays the Save Drawing As dialog box (see SAVEAS) and saves the drawing with the file name you specify. If the drawing is read-only, use the SAVEAS command to save the changed file under a different name. This command allows you to save the drawing under the current file name or a specified name

Prerequisite: None

Keyboard Command: SAVE or QSAVE

Save As

This command allows you to save the current drawing and assign the file name which allows you to give an unnamed drawing a file name or rename the current drawing. You can also use this command to save the current drawing to a different file format. You can save a drawing to an earlier version of the drawing format (DWG) or drawing interchange format (DXF), or save a drawing as a template file. Choose the format from Files of Type in the Save Drawing As dialog box.

If you save the file as a drawing template, the program displays the Template Description dialog box, where you can provide a description for the template and set the units of measurement.

Prerequisite: None

Keyboard Command: SAVEAS

Plot

This command allows you to plot a drawing to a plotting device or file.

Carlson TakeOff displays the Plot dialog box. Choose OK to begin plotting with the current settings and display the Plot Progress dialog box.

1 The Plot dialog box includes the tabs, Plot Device and Plot Settings, and several options to customize the plot.

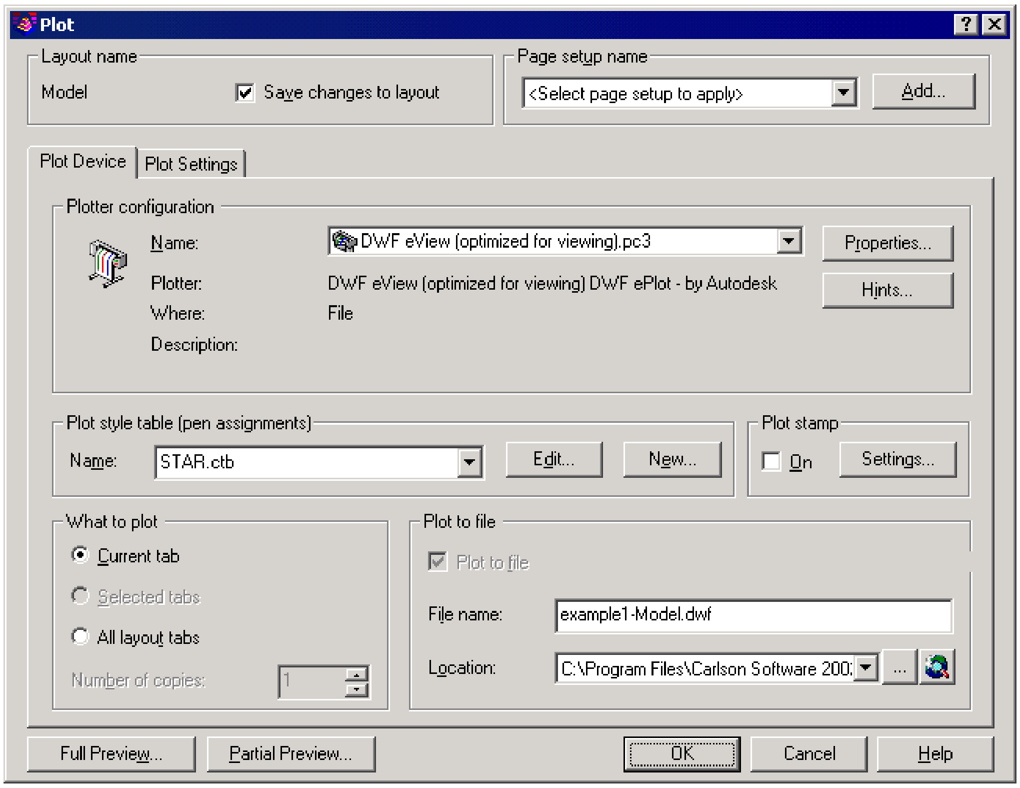
- Layout Name: This option displays the current layout name or displays "Selected layouts" if multiple tabs are selected. If the Model tab is current when you choose Plot, the Layout Name shows "Model."

- Save Changes to Layout: This option saves the changes you make in the Plot dialog box in the layout. This option is unavailable if multiple layouts are selected.

- Page Setup Name: This option displays a list of any named and saved page setups. You can choose to base the current page setup on a named page setup, or you can add a new named page setup by choosing Add.

- Add: This option displays the User Defined Page Setups dialog box. You can create, delete, or rename named page setups.

2 Under the Plot Device Tab you can specify the plotter to use, a plot style table, the layout or layouts to plot, and information about plotting to a file.



Plot

Layout name: Model

☑ Save changes to layout

Page setup name: <Select page setup to apply>

Plot Device | Plot Settings

Plotter configuration

Name: DWF eView (optimized for viewing).pc3

Plotter: DWF eView (optimized for viewing) DWF ePlot - by Autodesk

Where: File

Description:

Plot style table (pen assignments)

Name: STAR.ctb

Plot stamp

☐ On

What to plot

● Current tab

○ Selected tabs

○ All layout tabs

Number of copies: 1

Plot to file

☑ Plot to file

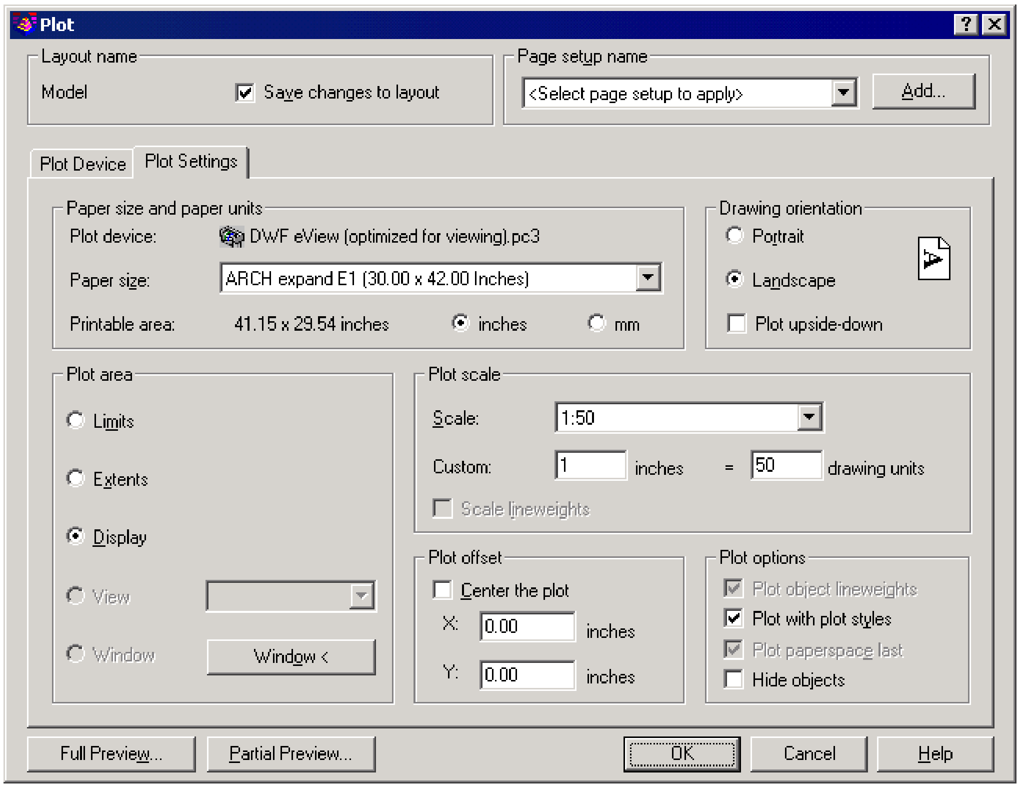
File name: example1-Model.dwf

Location: C:\Program Files\Carlson Software 200

- Plotter Configuration: This field displays the currently configured plotting device, the port to which it's connected or its network location, and any additional user-defined comments about the plotter. A list of the available system printers and PC3 file names is displayed in the Name list. An icon is displayed in front of the plotting device name to identify it as a PC3 file name or a system printer.

- Properties: The option displays the Plotter Configuration Editor (PC3 Editor), where you can modify or view the current plotter configuration, ports, device, and media settings.
- Hints: This option displays information about the specific plotting device.
- Plot Style Table (Pen Assignments): This option sets the plot style table, edits the plot style table, or creates a new plot style table.
- Name: This option displays the plot style table assigned to the current Model tab or layout tab and a list of the currently available plot style tables. If more than one layout tab is selected and the selected layout tabs have different plot style tables assigned, the list displays "Varies."
- Edit: This option displays the Plot Style Table Editor, where you can edit the selected plot style table.
- New: This option displays the Add-a-Plot-Style-Table wizard, which you can use to create a new plot style table.
- Plot Stamp: This option places a plot stamp on a specified corner of each drawing and/or logs it to a file.
- On: This options turns on plot stamping.
- Settings: This option displays the Plot Stamp dialog box, where you can specify the information you want applied to the plot stamp, such as drawing name, date and time, and plot scale.
- What to Plot: This field defines the tabs to be plotted.
- Current Tab: This option plots the current Model or layout tab. If multiple tabs are selected, the tab that shows its viewing area is plotted.
- Selected Tabs: This option plots multiple preselected Model or layout tabs. To select multiple tabs, hold down CTRL while selecting the tabs. If only one tab is selected, this option is unavailable.
- All Layout Tabs: This option plots all layout tabs, regardless of which tab is selected.
- Number of Copies: This option denotes the number of copies that are plotted. If multiple layouts and copies are selected, any layouts that are set to plot to a file or AutoSpool produce a single plot.
- Plot to File: This option plots output to a file rather than to the plotter.
- File Name: This option specifies the plot file name. The default plot file name is the drawing name and the tab name, separated by a hyphen, with a .plt file extension.
- Location: This option displays the directory location where the plot file is stored. The default location is the directory where the drawing file resides.
- [...]: This option displays a standard Browse for Folder dialog box, where you can choose the directory location to store a plot file.

3 Under the Plot Settings Tab you specify paper size, orientation, plot area and scale, offset, and other options.



Layout name: Model ☑ Save changes to layout

Page setup name: <Select page setup to apply>

Paper size and paper units

Plot device: DWF eView (optimized for viewing).pc3

Paper size: ARCH expand E1 (30.00 x 42.00 Inches)

Printable area: 41.15 x 29.54 inches ● inches ○ mm

Drawing orientation: ○ Portrait ● Landscape ☐ Plot upside-down

Plot area: ○ Limits ○ Extents ● Display ○ View ○ Window

Plot scale: Scale: 1:50 Custom: 1 inches = 50 drawing units ☐ Scale lineweights

Plot offset: ☐ Center the plot X: 0.00 inches Y: 0.00 inches

Plot options: ☑ Plot object lineweights ☑ Plot with plot styles ☑ Plot paperspace last ☐ Hide objects

- Paper Size and Paper Units: This field displays standard paper sizes available for the selected plotting device. Actual paper sizes are indicated by the width (X axis direction) and height (Y axis direction). If no plotter is selected, the full standard paper size list is displayed and available for selection. A default paper size is set for the plotting device when you create a PC3 file with the Add-a-Plotter wizard. The paper size you select is saved with a layout and overrides the PC3 file settings. If you are plotting a raster image, such as a BMP or TIFF file, the size of the plot is specified in pixels, not in inches or millimeters.
- Plot Device: This field displays the name of the currently selected plot device.
- Paper Size: This field displays a list of the available paper sizes.
- Printable Area: This field displays the actual area on the paper that is used for the plot based on the current paper size.
- Inches: This option allows you to specify inches for the plotting units.
- MM: This option allows you to specify millimeters for the plotting units.
- Drawing Orientation: This option specifies the orientation of the drawing on the paper for plotters that support landscape or portrait orientation. You can change the drawing orientation to achieve a 0-, 90-, 180-, or 270-degree plot rotation by selecting Portrait, Landscape, or Plot Upside-Down. The paper icon represents the media orientation of the selected paper. The letter icon represents the orientation of the drawing on the page.
- Portrait: This option orients and plots the drawing so that the short edge of the paper represents the top of the page.
- Landscape: This option orients and plots the drawing so that the long edge of the paper represents the top of the page.
- Plot Upside-Down: This option orients and plots the drawing upside down.
- Plot Area: This option specifies the portion of the drawing to be plotted.
- Layout: This option plots everything within the margins of the specified paper size, with the origin calculated from 0,0 in the layout. Available only when a layout is selected. If you choose to turn off the paper image and layout background on the Display tab of the Options dialog box, the Layouts selection becomes Limits.

- Limits: This option plots the entire drawing area defined by the drawing limits. If the current viewport does not display a plan view, this option has the same effect as the Extents option. Available only when the Model tab is selected.

- Extents: This option plots the portion of the current space of the drawing that contains objects. All geometry in the current space is plotted. TakeOff may regenerate the drawing to recalculate the extents before plotting.

- Display: This option plots the view in the current viewport in the selected Model tab or the current paper space view in the layout.

- View: This option plots a previously saved view. You can select a named view from the list provided. If there are no saved views in the drawing, this option is unavailable.

- Window: This option plots any portion of the drawing you specify. If you select Window, the Window button becomes available. Choose the Window button to use the pointing device to specify the two corners of the area to be plotted or enter coordinate values.

- Plot Scale: This option controls the plot area. The default scale setting is 1:1 when plotting a layout. The default setting is Scaled to Fit when plotting a Model tab. When you select a standard scale, the scale is displayed in Custom.

- Scale: This option defines the exact scale for the plot. The four most recently used standard scales are displayed at the top of the list.

- Custom: This option creates a custom scale. You can create a custom scale by entering the number of inches or millimeters equal to the number of drawing units.

- Scale Lineweights: This option scales lineweights in proportion to the plot scale. Lineweights normally specify the linewidth of printed objects and are plotted with the linewidth size regardless of the plot scale.

- Plot Offset: This field specifies an offset of the plotting area from the lower-left corner of the paper. In a layout, the lower-left corner of a specified plot area is positioned at the lower-left margin of the paper. You can offset the origin by entering a positive or negative value. The plotter unit values are in inches or millimeters on the paper.

- Center the Plot: This option automatically calculates the X and Y offset values to center the plot on the paper.

- X: This field specifies the plot origin in the X direction.

- Y: This field specifies the plot origin in the Y direction.

- Plot Options: This field specifies options for lineweights, plot styles, and the current plot style table. You can select whether lineweights are plotted. By selecting Plot with Plot Styles, you plot using the object plot styles that are assigned to the geometry, as defined by the plot style table.

- Plot object lineweights: This option plots lineweights.

- Plot with Plot Styles: This option plots using the plot styles applied to objects and defined in the plot style table. All style definitions with different property characteristics are stored in the plot style tables and can be easily attached to the geometry. This setting can replace pen mapping in earlier versions of AutoCAD.

- Plot Paperspace Last: This option plots model space geometry first. Paper space geometry is usually plotted before model space geometry.

- Hide Objects: This option plots layouts with hidden lines removed for objects in the layout environment (paper space). Hidden line removal for model space objects in viewports is controlled by the Viewports Hide property in the Object Property Manager. This is displayed in the plot preview, but not in the layout.

- Full Preview: This option displays the drawing as it will appear when plotted on paper. To exit the print preview, right-click and choose Exit.

- Partial Preview: This option quickly shows an accurate representation of the effective plot area relative to the paper size and printable area. Partial preview also gives advance notice of any warnings that you might encounter when plotting. The final location of the plot depends on the plotter. Changes that modify the effective plot area include those made to the plot origin, which you define under Plot Offset on the Plot Settings tab. If you offset the origin so much that the effective area extends outside the preview area, the program displays a warning.

Prerequisite: None

Keyboard Command: PLOT

Recover

This command opens a drawing file and scans it for errors. Use this command if Carlson TakeOff crashes while using the regular **Open** command.

Prerequisite: none

Keyboard Command: recover

Audit

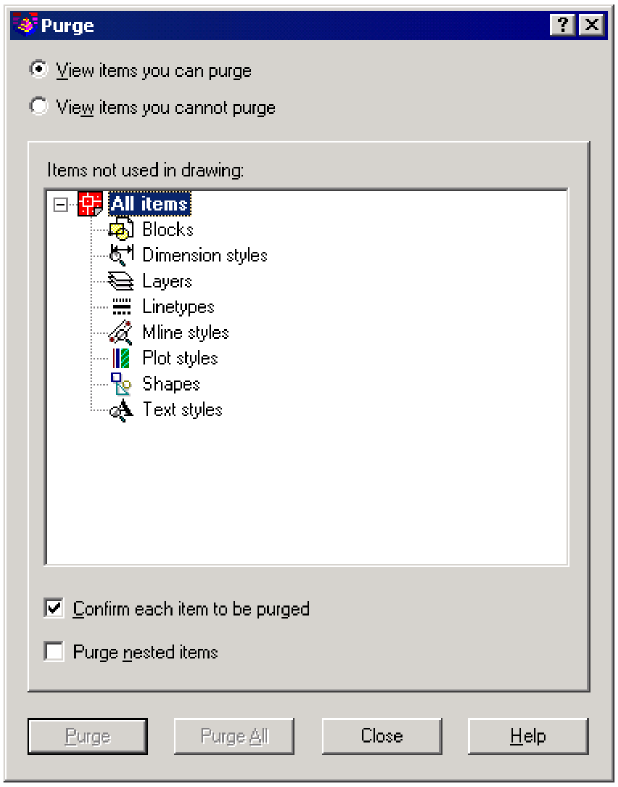
This command scans your current drawing and looks for any corruption and has the option to fix any errors.

Prerequisite: none

Keyboard Command: audit

Purge

Displays a tree view summary of all named objects that can and can't be purged in the current drawing. The View Items You Can Purge and View Items You Cannot Purge options toggle the dialog box display, showing different options and tree view summaries.



Purge

● View items you can purge

○ View items you cannot purge

Items not used in drawing:

☑ Confirm each item to be purged

☐ Purge nested items

All items
Blocks
Dimension styles
Layers
Linetypes
Mline styles
Plot styles
Shapes
Text styles
Purge
Purge All
Close
Help

Items Not Used in Drawing: Displays a tree view of all named object categories (blocks, layers, and so on) in the current drawing. A plus sign appears next to the object category names that you can purge. Clicking the plus sign or double-clicking an object category expands the tree view, displaying all unused named objects that exist for the category. To purge all unused named objects, select All Items in the tree view, and choose Purge All. To purge a specific named object category, select the category in the tree view, and choose Purge.

Confirm Each Item to Be Purged: Displays the Verify Purge dialog box when you purge an item.

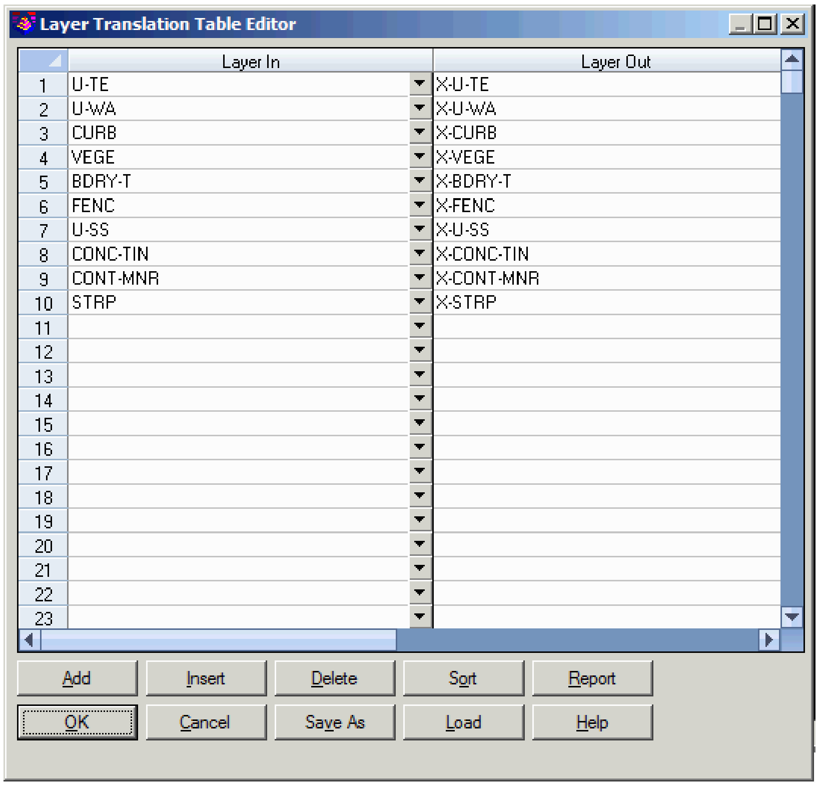
Purge Nested Items: Removes all unused named objects from the drawing even if they are contained within or referenced by other unused named objects. The Verify Purge dialog box is displayed, and you can cancel or confirm the items to be purged.

Prerequisite: None

Keyboard Command: purge

Translate Layers

This command renames layers using a lookup table with pairs of original and renamed layer names. This command can be used to convert the layers for a drawing from another source to match your layer standards. The layer names are entered in a spreadsheet. The Add, Insert, Delete and Sort buttons work on the spreadsheet rows. The Report button makes a report for the layer assignments. The SaveAs and Load functions store and recall the layer assignments to a .LTF file for sharing the settings or keeping different sets of layer assignments.



	Layer In	Layer Out
1	U-TE	X-U-TE
2	U-WA	X-U-WA
3	CURB	X-CURB
4	VEGE	X-VEGE
5	BDRY-T	X-BDRY-T
6	FENC	X-FENC
7	U-SS	X-U-SS
8	CONC-TIN	X-CONC-TIN
9	CONT-MNR	X-CONT-MNR
10	STRP	X-STRP
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		

Pulldown Menu Location: File > Drawing Utilities
Keyboard Command: translayers
Prerequisite: None

Remove XData

This command removes the xdata (Extended Entity Data) from the selected entities. Many Carlson routines add xdata to entities in order to add extra program specific information to them. Carlson programs use the xdata to make entities more intelligent. For example, when you draw a centerline (.cl) as a polyline, xdata is attached to the polyline that stores the reference of the .cl file name. Then if you double-click the polyline, then the program can read the xdata to know the polyline is a centerline and launch the centerline editor. By removing the xdata, the entities revert to regular CAD entities which is useful if you want to detach these entities from the program links.

Prompts

Select entities to remove extended entity data from.
Select objects: *pick the entities*

Pulldown Menu Location: File > Drawing Utilities
Keyboard Command: xxdata
Prerequisite: Entities with xdata

Remove Reactors

This command removes the reactor links from the selected points, text, polylines and lines. This disables the links for points to the coordinate (.CRD) file, annotation with linework and linework with points. Note that is *General Settings* there is a section called Object Linking. This is the specific section that contains the options for creating these reactors to the drawing entities. Reactors can be turned off for entities created later by clicking off the four link options in *General Settings.* To get to this dialog go to *Settings* > *Configure* > *General Settings*.

Prompts

Select entities to remove reactors from:
Select objects: *pick the entities*

Pulldown Menu Location: File > Drawing Utilities
Keyboard Command: delreact
Prerequisite: Entities with reactors

Remove Groups

This command is used to "ungroup" selected entities that, prior to using this command, were part of a group. For our purposes, we might more specifically be referring to Carlson's Point Entity Grouping feature. A group is a named selection set of objects. This routine removes selected entities from groups. It is especially useful when dealing with our Carlson points.

More on Point Entity Grouping: As mentioned in the Points chapter, remember that for each point, the point attribute block, node, and symbol can be bound together. This means that if you choose to use the *Move* command (or other CAD tools) the entire collection moves together. This is done using the grouping functionality in AutoCAD or IntelliCAD. To disable this system altogether, go to *Configure*, choose *General Settings*, and turn off the toggle for Group Point Entities. If you need to temporarily disable grouping in a drawing, you can use the AutoCAD toggle for grouping, which is Ctrl-A. Holding down the Ctrl key, and pressing the letter A on the keyboard, activates this two-way toggle, with the current status echoed to the command prompt area.

Prompts

Select entities to remove from groups.
Select objects: select entities

Pulldown Menu Location: File > Drawing Utilities
Keyboard Command: rmgroup
Prerequisite: Entities in group(s)

Store Project Archive

This command creates an archive of the current project. The archive contains the drawing file (.dwg) and all the associated data file such as the surfaces and layer target definitions. This archive can be used as a backup for the project or as a way to transfer the project to another computer. The format of the archive file is a standard .zip file which can be used by WinZip.

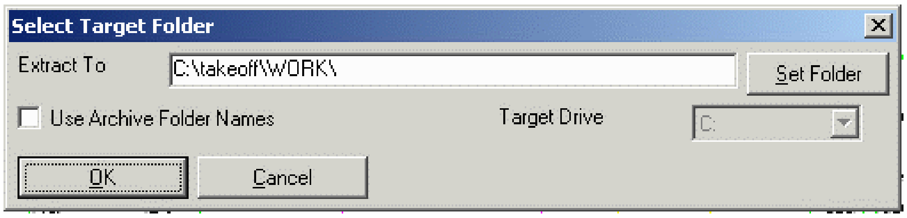
When this command is run, the program will ask for a file name of the archive to create. Enter a name and pick the Save button. The number of files stored to the archive is reported at the command line.

Prerequisite: an active Takeoff project

Keyboard Command: zip_project

Extract Project Archive

This command reads the project files from an archive created by the Store Project Archive command. The archive contains the drawing file (.dwg) and all the associated data file such as the surfaces and layer target definitions. Since the archive contains the drawing file, you should not have the same project drawing open in Takeoff while extracting the archive. The format of the archive file is a standard .zip file which can be used by WinZip.


Select Target Folder

Extract To: C:\takeoff\WORK\

☐ Use Archive Folder Names

Target Drive: C:

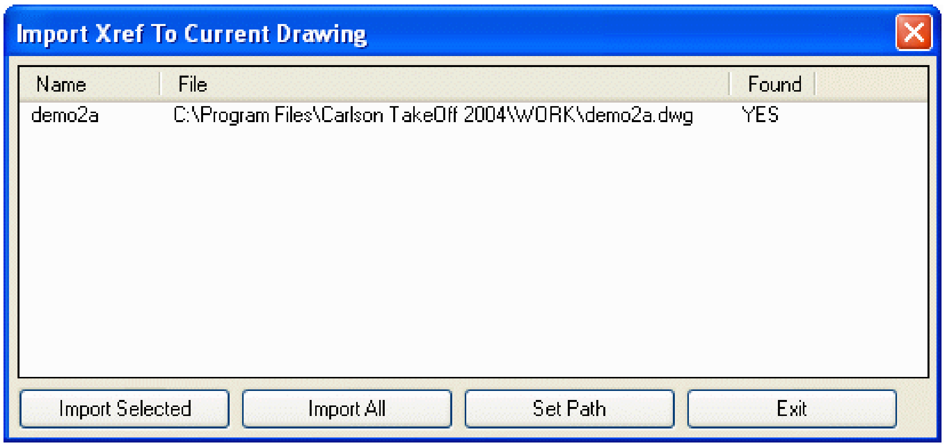
The command starts by prompting for the archive file to open. Then there is a dialog with extraction options. You can either extract the files to the specified folder or use the folder names stored in the archive. When using the archive folders, there is a setting to choose the target drive because the archive has the folder names but not the drive names.

Prerequisite: a Takeoff archive file

Keyboard Command: unzip_project

Import Xref to Current Drawing

This command allows you to import external reference files (Xrefs) into the current drawing. Before Xrefs are imported, the drawing data from the Xrefs can be viewed but not modified. This import routine has a simplier method for importing than the Xref Manager command. A list is shown of the Xrefs that are attached to the current drawing. If the Xref file is not found, you can pick the Set Path button to locate the drawing file. To import an Xref, highlight the file name and Pick Import.



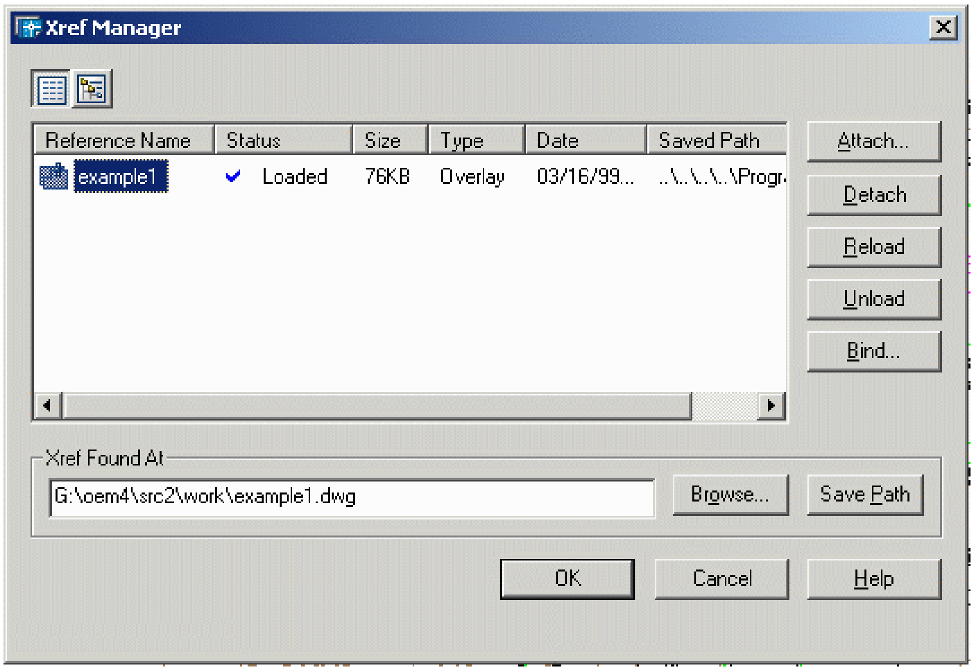
Name	File	Found
demo2a	C:\Program Files\Carlson TakeOff 2004\WORK\demo2a.dwg	YES

Prerequisite: files to import

Keyboard Command: import_xref

Xref Manager

Attaches, overlays, lists, binds, detaches, reloads, unloads, renames, and modifies paths to external references (Xrefs) in the current (or host) drawing. Displays the Xrefs in the drawing in a tree view or a list view. You can use the F3 and F4 keys to switch between list view and tree view.



Reference Name	Status	Size	Type	Date	Saved Path
example1	✓ Loaded	76KB	Overlay	03/16/99...	..\..\..\..\Progr

Xref Found At: G:\oem4\src2\work\example1.dwg

List View: Displays a flat listing of the attached Xrefs and their associated data. You can sort the list of references by name, status, type, file date, file size, or the saved path and file name.

Reference Name: Lists the names of the Xrefs as stored in the definition table for the drawing. Status: Shows whether the Xref is loaded, unloaded, unreferenced, not found, unresolved, orphaned, or marked for unloading or reloading.

- Loaded: Currently attached to the drawing.
- Unloaded: Marked to be unloaded from the drawing once the Xref Manager is closed.
- Unreferenced: Attached to the drawing but erased.
- Not Found: No longer exists in the valid search paths.
- Unresolved: Cannot be read by AutoCAD.
- Orphaned: Attached to another Xref that is unreferenced, unresolved, or not found.

Size: Shows the file size of the corresponding reference drawing. The size is not displayed if the Xref is unloaded, not found, or unresolved.
Type: Indicates whether the Xref is an attachment or an overlay.
Date: Displays the last date the associated drawing was modified. This date is not displayed if the Xref is unloaded, not found, or unresolved.
Saved Path: Shows the saved path of the associated Xref (this is not necessarily where the Xref is found).
Tree View: Displays a hierarchical representation of the Xrefs, displaying the relationships between Xref definitions. Tree view shows the level of nesting relationship of the attached Xrefs, whether they are attached or overlaid, and whether they are loaded, unloaded, marked for reload or unload, or not found, unresolved, or unreferenced.
Attach: Displays the External Reference dialog box if an external reference is selected or displays the Select Reference File dialog box if no external reference is selected.
Detach: Detaches one or more Xrefs from your drawing, erasing all instances of a specified Xref and marking the Xref definition for deletion from the symbol table. Only the Xrefs attached or overlaid directly to the current drawing can be detached; nested Xrefs cannot be detached. Carlson TakeOff cannot detach an Xrefreferenced by another Xref or block.
Reload: Marks one or more Xrefs for reloading. This option rereads and displays the most recently saved version of the drawing.

Unload: Unloads one or more Xrefs. Unloaded Xrefs can be easily reloaded. Unlike detaching, unloading does not remove the Xref permanently. It merely suppresses the display and regeneration of the Xrefdefinition to improve performance.

Bind: Displays the Bind Xrefs dialog box Xref. The Bind option makes the selected Xrefand its dependent symbols (such as blocks, teXreft styles, dimension styles, layers, and linetypes) a part of the current drawing.
Found At: Displays the full path of the currently selected Xref. This is where the Xref is actually found and is not necessarily the same as the saved path.
Browse: Displays the Select New Path dialog boXref (a standard file selection dialog boXref), in which you can select a different path or file name.

Save Path: Saves the path, as it appears in XrefFound At, to the currently selected Xref.

Prompts

```
Command: _Xref
Overlay Xref "example1": ..\..\..\..\Program Files\Carlson TakeOff
2004\WORK\example1.dwg
"example1" loaded: G:\oem4\src2\work\example1.dwg

Specify insertion point or [Scale/X/Y/Z/Rotate/PScale/PX/PY/PZ/PRotate]:
Command: Specify opposite corner:
Select objects: Enter
```

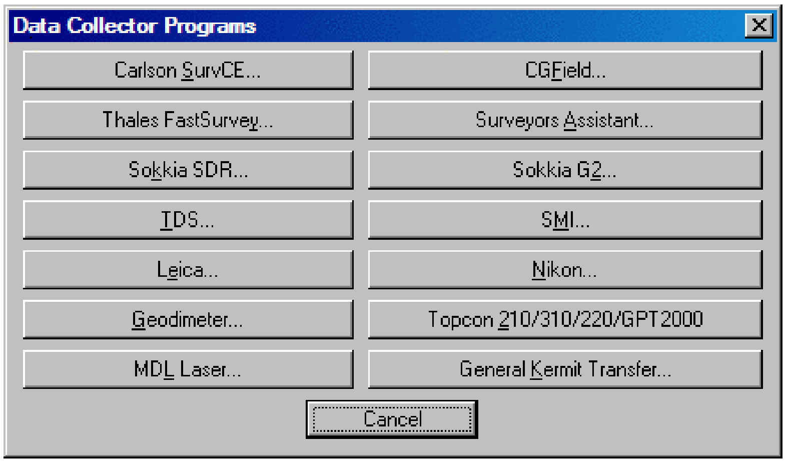
Prerequisite: multiple files

Keyboard Command: Xref

Data Collectors

This command does two main functions for a variety of popular data collectors. First, this command transfers (uploads and downloads) data between the data collector and Carlson. Second, this command converts data formats between the data collector format and the Carlson format. So, if you already have the data file on the computer, you can skip the transfer function and just perform the conversion function.

The transfer function does the conversion at the same time. In most cases, the download from the data collector produces a raw (.RW5) file (field notes) and/or a coordinate (.CRD) file (coordinate points). Several of the download programs have an option to automatically run the *Edit-Process Raw Data File* command after downloading raw data. You can also send, or upload, a coordinate (.CRD) file. The dialog shown here appears when the menu command is selected.



Carlson SurvCE: For Carlson Software data collection programs SurvCE and SurvStar. This button produces the SurvCOM dialog and program.
CG Field: For CG Field programs.
Thales FastSurvey: For Thales and FastSurvey intstruments.
Surveyors Assistant: For data collectors running Surveyors Assistant software (Corvallis MC2, MC5 and Pentax SC5).
Sokkia SDR: For SDR2 through SDR 33 and other collectors that have a SDR format like the Trimble.
Sokkia G2: Specifically for the SDR2.
TDS: For data collectors that use TDS software (Ranger, HP48, HP95, Husky FS-2 & FS-3, Corvallis MC-V and TOPCON FS2, FC95 and FC48).
SMI: For SMI data collectors on the HP48.
Leica: For Leica GIF-10 module and Leica instruments.
Nikon: For Nikon DTM and DR-48 total stations.
Geodimeter: For the Geodimeter Geodat collector.
Topcon 210/310/220/GPT2000: Supports these Topcon models.
MDL Laser: For MDL Laser instruments.
General Kermit Transfer: For general transferring using Kermit.

Carlson SurvCE

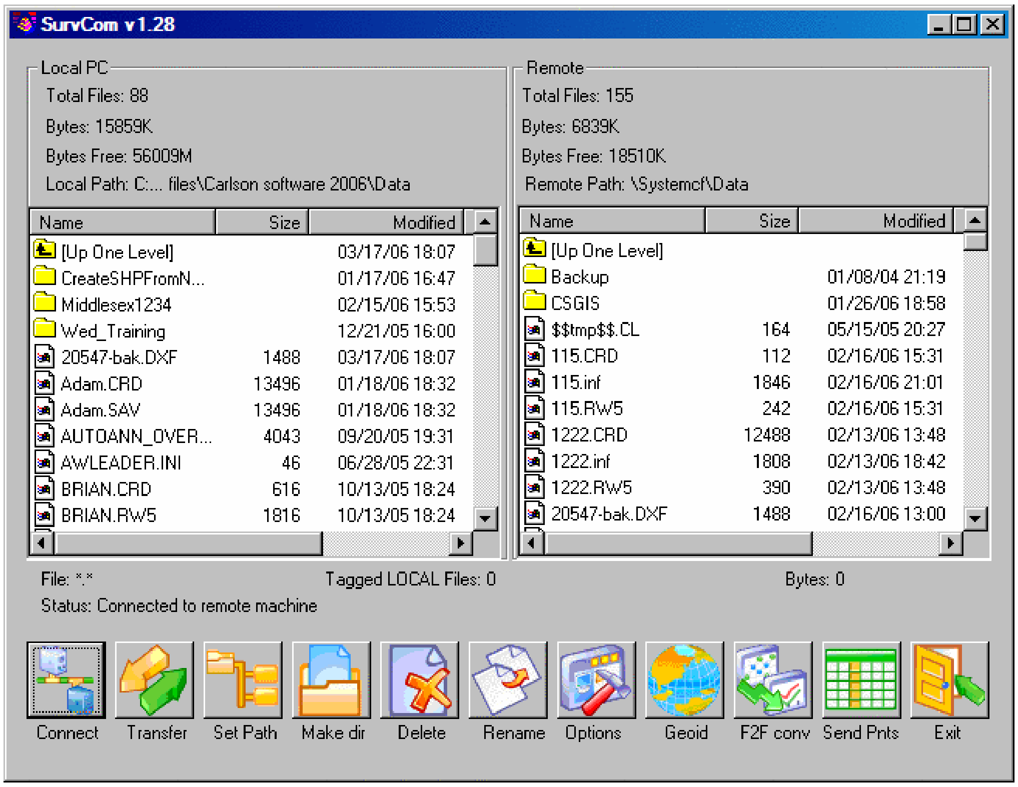
Note: In the following text, the term SurvCE will apply to SurvCE, SurvStar, and Sokkia G2

Connect the serial cable. Select Data Transfer from the on the handheld. Choose Carlson/Carlson Survey Download. This leads to a File Transfer screen on SurvCE, which says "Awaiting Connection". All the action is on the PC side. There is no time delay in this handshake. It will wait for the PC program to catch up. When you connect the cable from SurvCE to the PC, Microsoft ActiveSync may interfere and say "Connect to PC?" If you get this question, say No or otherwise terminate the Microsoft ActiveSync linkage. Start the Carlson portion of this link by choosing Survey, Data Collectors, then the SurvCE option. If connection is automatically established, SurvCE will display, "Connected to PC".

If only the left side of the screen displays data, then you do not yet have a connection. Press the Connect button located at the bottom left of the file transfer dialog. The transfer program will respond with Retrieving File List. Once the file list has been retrieved, the left side of the dialog box will show files located in the specified path on the PC and the right side of the dialog displays the files located in the designated path on the remote. You can change directories by scrolling to the top of the file list and choosing Up One Level (just like in Windows).

To transfer one or more files, simply select or highlight the desired files and select the transfer button. More than one file can be transferred from the remote to the PC or from the PC to the remote during the transfer process. Standard Windows selection options apply. For example, selecting one file and then while pressing the shift key on the PC, selecting another file deeper on the list will select all the files in between the first and last selected. You can also select the first file to transfer and press and hold down the shift key and use the down arrow to specify the range of files to transfer. Pressing and holding the control key on the keyboard allows for the selection of multiple files in any selection order, by picking the files with the left mouse button.

After the files have been selected, press the transfer button. When the transfer is complete, the program will return a "Transfer Complete" message, and will then proceed to update the file lists on the PC and the Remote.


SurvCom v1.28

Local PC
Total Files: 88
Bytes: 15859K
Bytes Free: 56009M
Local Path: C:... files\Carlson software 2006\Data

Name	Size	Modified
[Up One Level]		03/17/06 18:07
CreateSHPFromN...		01/17/06 16:47
Middlesex1234		02/15/06 15:53
Wed_Training		12/21/05 16:00
20547-bak.DXF	1488	03/17/06 18:07
Adam.CRD	13496	01/18/06 18:32
Adam.SAV	13496	01/18/06 18:32
AUTOANN_OVER...	4043	09/20/05 19:31
AWLEADER.INI	46	06/28/05 22:31
BRIAN.CRD	616	10/13/05 18:24
BRIAN.RW5	1816	10/13/05 18:24

Remote
Total Files: 155
Bytes: 6839K
Bytes Free: 18510K
Remote Path: \Systemcf\Data

Name	Size	Modified
[Up One Level]		
Backup		01/08/04 21:19
CSGIS		01/26/06 18:58
$$tmp$$.CL	164	05/15/05 20:27
115.CRD	112	02/16/06 15:31
115.inf	1846	02/16/06 21:01
115.RW5	242	02/16/06 15:31
1222.CRD	12488	02/13/06 13:48
1222.inf	1808	02/13/06 18:42
1222.RW5	390	02/13/06 13:48
20547-bak.DXF	1488	02/16/06 13:00

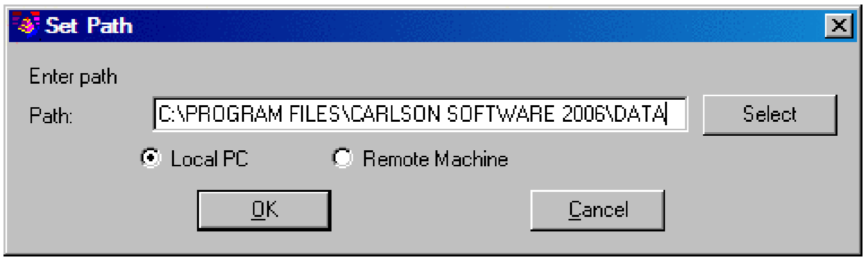
File: *.*
Tagged LOCAL Files: 0
Bytes: 0
Status: Connected to remote machine

The following information describes the buttons on the bottom row of the SurvCOM dialog box. The button name is on the left in bold:

Connect: After selecting Data Transfer in SurvCE, press this button to start the connection. Once connection is made, the status line on the
file transfer utility dialog box will show Connected to the remote machine.

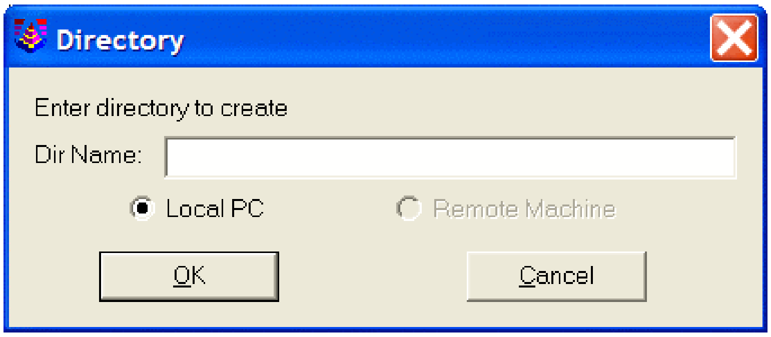
Transfer: Pressing this button transfers selected files from either the Remote to the PC, or the PC to the Remote.

Set Path: This option allows for the specification of the desired source and destination drives and folders for both the PC and the Remote device. For example, if you were downloading, or copying files from the Remote device to the PC, to specify a source path on the remote device, select the Remote Machine toggle and then type in the desired path in the path field. To specify a destination path on the PC, select the Local PC toggle and type in the desired path the path field. When a change to either path is made, the transfer utility will retrieve a new file list from the specified paths.


Set Path

Enter path
Path: C:\PROGRAM FILES\CARLSON SOFTWARE 2006\DATA
● Local PC ○ Remote Machine

Make dir: This option allows for creation of directories on both the PC and the Remote device. Specify the hardware on which to create the directory and then enter the directory name.

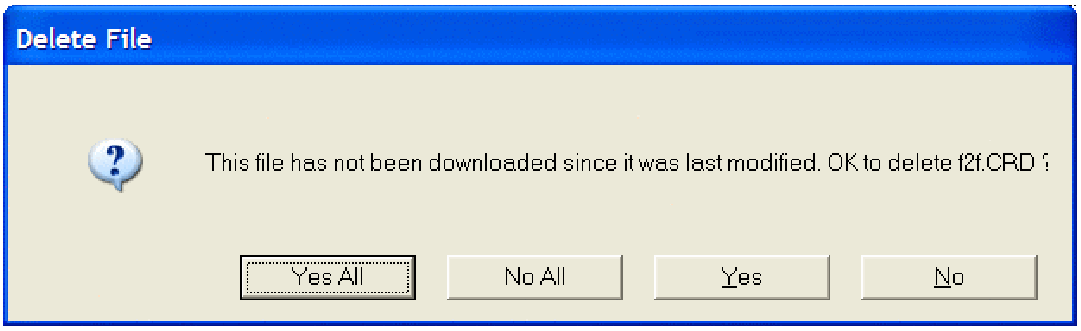


Enter directory to create

Dir Name:

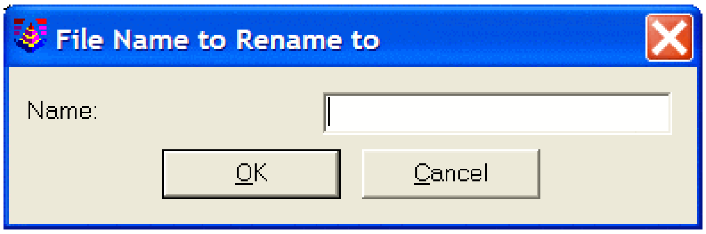
● Local PC ○ Remote Machine

Delete: This option allows you to delete the tagged files. To delete a file, select the file to delete by clicking on the file, press the delete button at the bottom of the dialog. Confirm deletion by selecting the appropriate response on the Delete File dialog.



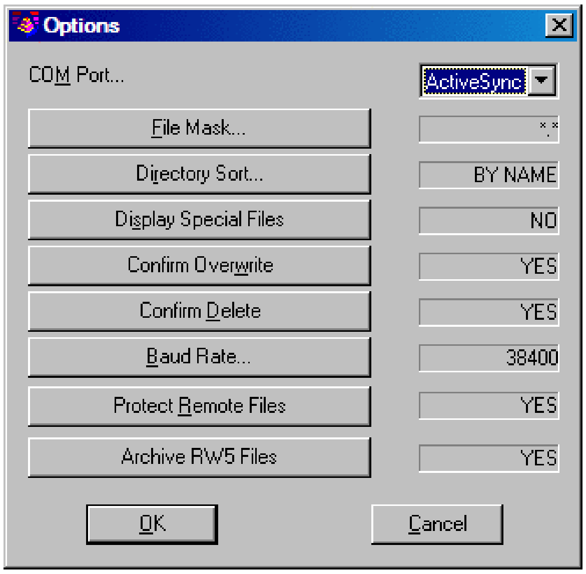
This file has not been downloaded since it was last modified. OK to delete f2f.CRD ?

Rename: To rename a file, click on the file to rename and select the rename button at the button of the dialog. On the dialog that displays type in the new name and press the OK button.



Name:

Options: This command allows you to set various options for data transfer. The dialog shown below will appear.



COM Port... ActiveSync

File Mask... *.*

Directory Sort... BY NAME

Display Special Files NO

Confirm Overwrite YES

Confirm Delete YES

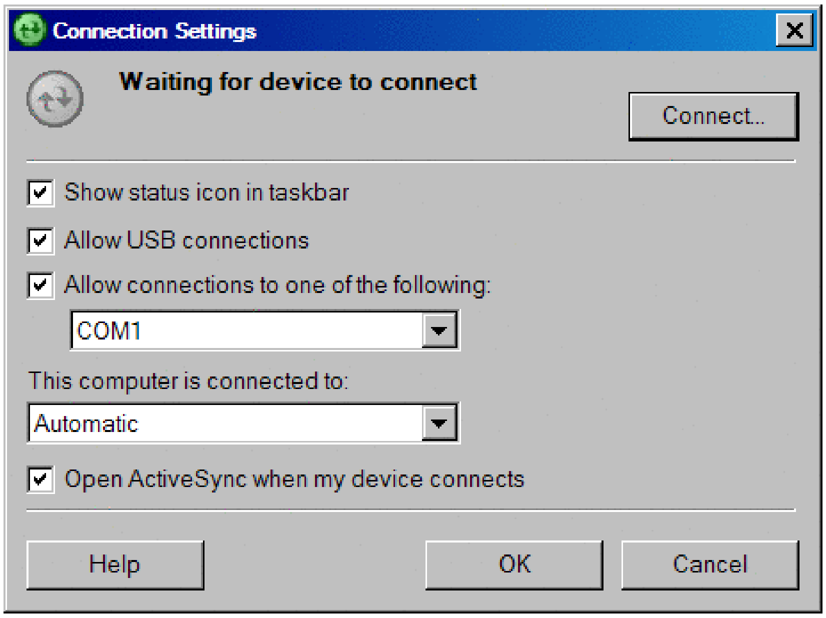
Baud Rate... 38400

Protect Remote Files YES

Archive RW5 Files YES

Com Port: You must select which com port on the PC to use.

If you are transferring data via a USB port, set the com port to ActiveSync, see the Options section below for procedures to change com ports. To transfer data using an USB port a connection between the Remote and PC using ActiveSync is required. In ActiveSync verify that the "Connect Settings" have been set to "Allow serial cable or infrared connection to this Com port" and Allow USB connection with this desktop computer. This will allow for connection using an USB port or a COM port connection. Both will use ActiveSync to transfer data between devices.



Waiting for device to connect

☑ Show status icon in taskbar

☑ Allow USB connections

☑ Allow connections to one of the following:

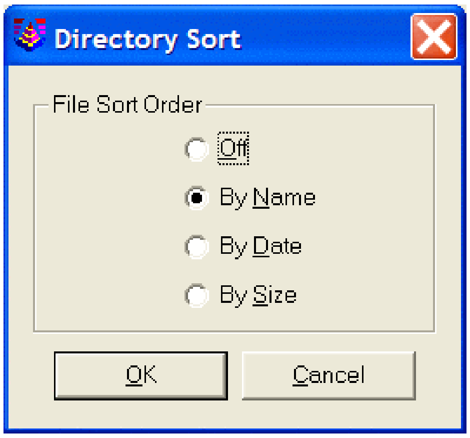
COM1

This computer is connected to:

Automatic

☑ Open ActiveSync when my device connects

File Mask: You must select a file filtering syntax. This filter allows for the setting of specific file types to display. For example if you only wanted to see CRD files the filter would be $*$.CRD.
Directory Sort: You must select how to sort the list of files.


Directory Sort

File Sort Order

○ Off
● By Name
○ By Date
○ By Size

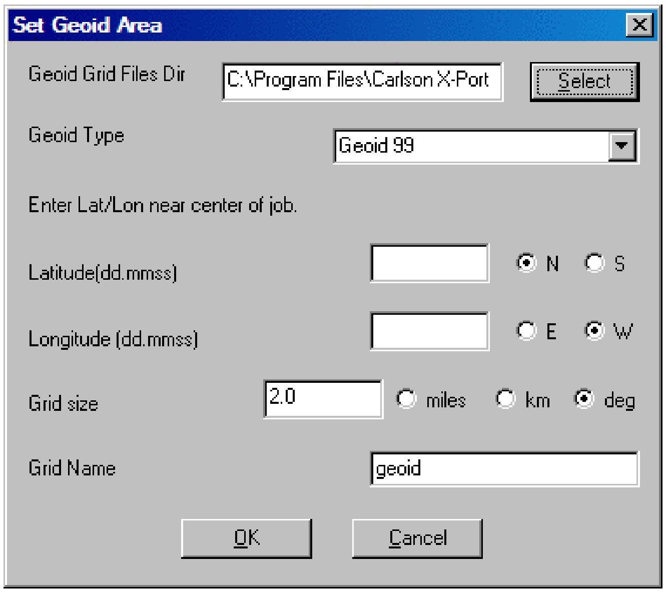
OK | Cancel

Display Special Files: Toggle whether or not you should see special files.
Confirm Overwrite: Check this to confirm before overwriting files.
Baud Rate: You must choose the baud rate for transferring data.
Protect Remote Files: Check this to protect files on the mobile device.
Archive RW5 Files: With this option set to YES, when downloading rw5 files, a second copy of the file will be made with a .SC5 extension to serve as an archive of the original rw5 file.

Geoid: This command will carve out a portion of the Geoid 99, EGM96, Canadian CGC2000, Canadian HT2.0, Canadian HT 1.01, Australian GDA94, Great Britain OSG-MO2 and Geoid 2003 grid files, and send it to SurvCE. Since these geoid grids are very large, this carves out a precise portion of it and avoids overloading the memory on the remote device running SurvCE. You will be prompted for the directory on the PC of the source Geoid grid file, the approximate latitude and longitude of the job, and the size of the area desired in miles, kilometers or degrees of latitude and longitude. To define a Geoid area, make sure that this criteria is met:

1. Specify the location of the geoid grid files.
2. Specify the geoid type.
3. Enter the latitude and longitude near the center of the job area.
4. Specify the Grid size either in miles, km (kilometers), or deg (degrees).
5. Name the grid file.

The file will be transferred to the data collector and place in the appropriate place for use.


Set Geoid Area

Geoid Grid Files Dir: C:\Program Files\Carlson X-Port | Select

Geoid Type: Geoid 99

Enter Lat/Lon near center of job.

Latitude(dd.mmss) ● N ○ S

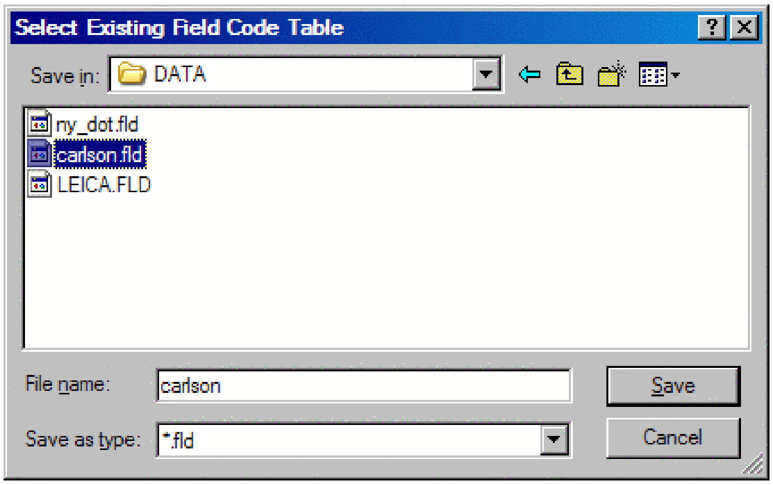
Longitude (dd.mmss) ○ E ● W

Grid size: 2.0 ○ miles ○ km ● deg

Grid Name: geoid

OK | Cancel

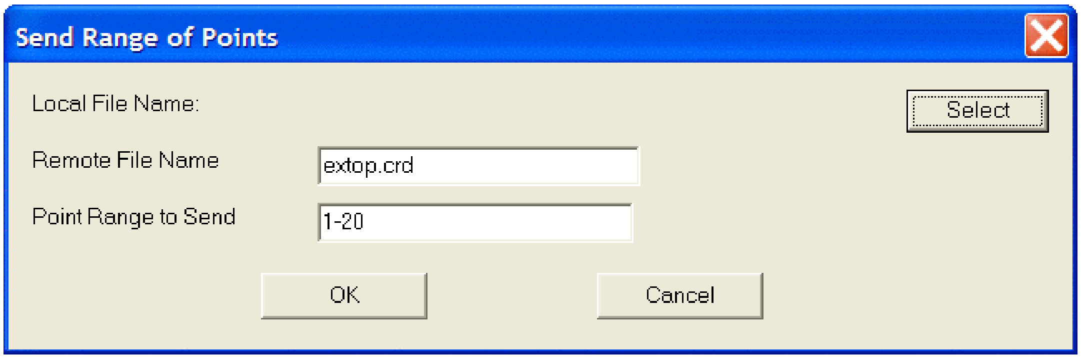
F2F conv: This converts the more thorough and detailed Carlson field code file (for field-to-finish work, ∗.FLD) to the more simplified Feature Code List that runs in SurvCE (∗.FCL). The Feature Code List in SurvCE (not SurvStar or Field) handles Linework (on or off), Line Type (2D or 3D), Layer (= Code) and Full Text (Description). Select the Carlson field code (∗.FLD) to convert, the conversion takes place and the file is transferred and located in the correct location for use in the data collector.



File name: carlson

Save as type: *.fld

Send Pnts: This option allows for the uploading of a user specified point number range out of the selected crd file to unload. Use the Select button to specify the crd file to upload. The Remote File Name will default to the name of the crd file selected to upload. You can change this name if needed. Specify the Point Range to Send and select the OK button.



Local File Name:

Remote File Name: extop.crd

Point Range to Send: 1-20

Exit: This command will exit the File Transfer Utility

The following information describes the buttons on the Data Collection Programs dialog box that come after the Carlson SurvCE buttom, moving from left to right and then from top to bottom. The command/button name is on the far left margin, in bold:

CG Field

To transfer data to and from data collectors using CGField software, first make sure that the Baud Rate is set to 9600 and the Parity is set to NONE then follow the steps outlined below.

Receiving a Coordinate File from CGField

CGField:

1) Go to the UTILS menu and select Option 1, C&G Transfer.

2) Select Option 4, "Send Coords"
3) Select the Coordinate file to send.

Stop here in CGField and go to Carlson.

Carlson:

Leave the FILE fields blank.

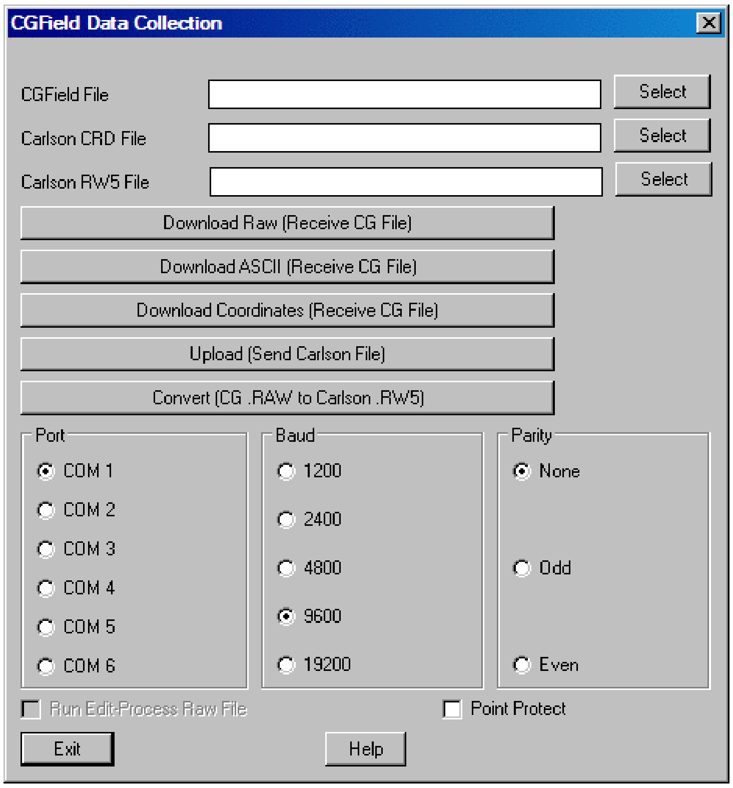
Press the "Download Coordinates" button to ready Carlson to receive the file.
Stop here in Carlson and go back to CGField to complete the transfer process.

CGField:

Select the points to send

1) For All points
2) To select Blocks of points.
3) From .PTS file (the set of points in a Batch Point File).

The coordinates will be transferred. After the transfer is complete, you will be asked for the CRD file name. The C&G CRD file will automatically be converted to a Carlson CRD file. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.


CGField Data Collection
CGField File
Select
Carlson CRD File
Select
Carlson RW5 File
Select
Download Raw (Receive CG File)
Download ASCII (Receive CG File)
Download Coordinates (Receive CG File)
Upload (Send Carlson File)
Convert (CG .RAW to Carlson .RW5)
Port
Baud
Parity
Exit
Help

Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6

Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600 ○ 19200

Parity: ● None ○ Odd ○ Even

☐ Run Edit-Process Raw File ☐ Point Protect

Receiving a Raw Data File from CGField

CGField:

1) Go to the UTILS menu and select Option 1, C&G Transfer.
2) Select Option 2, "Send Raw Data". Stop here in CGField and go to Carlson.

Carlson:

Leave the FILE fields blank.

Press the "Download Raw" button to ready Carlson to receive the file. Stop here in Carlson and go back to CGField.

CGField:

Select the raw data file to be sent. The transfer will begin.

The C&G .RAW file will be transferred and saved in the data folder. After the transfer is complete, you will be asked for the RW5 file name. The RAW file will be automatically converted to a Carlson RW5 file.

Receiving an ASCII file from CGField

This will allow you to transfer a C&G report file (RPT) or an ASCII NEZ file to Carlson.

CGField:

1) Go to the UTILS menu and select Option 1, C&G Transfer.
2) Select Option 6, "Send ASCII". Stop here in CGField and go to Carlson.

Carlson:

Leave the FILE fields blank.

Press the "Download ASCII" button to ready Carlson to receive the file. Stop here in Carlson and go back to CGField.

CGField:

Select the ASCII file to send.

After the transfer is complete, you will see the file in the Carlson editor. You can then select FILE and SAVE (or SAVEAS) to save the ASCII file.

Sending a Coordinate File to CGField

CGField:

1) Go to the UTILS menu and select Option 1, C&G Transfer.
2) Select Option 3, "Receive Coords" to ready the data collector. Stop here in CGField and go to Carlson.

Carlson:

Leave the FILE fields blank.

1) Press the "Upload (Send Carlson File)" button.
2) Select the Coordinate file.
3) Select the points to send.
4) Press the "Start Transfer" button.

CGField:

Carlson will send the file name to CGField and a coordinate file with the same name will be automatically created or opened in CGField.

If the file exists you will be asked how you want to handle duplicate points:

1) Overwrite
2) Don't Overwrite
3) Ask for each Point

The point transfer will begin.

Convert CG .RAW to Carlson .RW5

This utility allows you to convert a C&G raw data file to a Carlson raw data file. Select the C&G .RAW file to convert. Then enter the file name of the destination Carlson RW5 file.

Thales/FastSurvey You will be taken directly to the SurvCOM dialog, similar to the Carlson SurvCE process.

Surveyor's Assistant

Download

From the Surveyor's Assistant data collector, go to the Transfer routine from the main menu. Fill out the transfer screen as follows:

Direction: OUTPUT
Format: LIETZ
Data: Coordinate or All Data
Port: COM1 or COM2 Ckh Hold: NO
Protocol: NONE

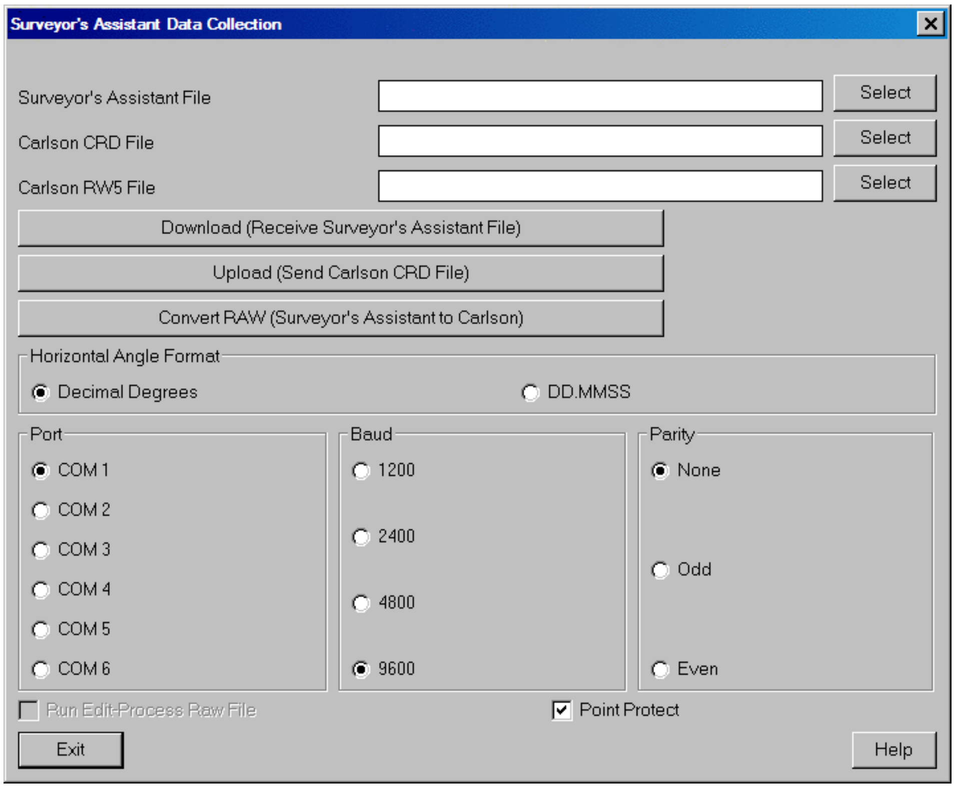
You should also check the settings under the PORT menu. Typical port settings are baud=9600, parity=none, data=8, stop=1 and handshake=XON/XOFF. Now in Carlson, run *Data Collection* in the Survey menu and choose Surveyor's Assistant. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to Surveyor's Assistant and press GO. The file transfer should now go. If the All Data option is used, then the Leitz format will contain both coordinate and raw data. The coordinate data is converted to a Carlson coordinate (.CRD) file and the raw data is converted to a Carlson raw data (.RW5) file. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload

Point data from the Carlson coordinate (.CRD) file can be uploaded into the Surveyor's Assistant. First go to the Transfer routine on the main menu. Fill out the screen as follows:

Direction: INPUT
Format: LEITZ
Port: COM1 or COM2
Protocol: NONE

Go back to Carlson and choose Surveyor's Assistant from the *Data Collection* command in the Survey menu. Check that the COM port and baud rate are set correctly. In the Carlson dialog, pick the Select File button next to the Carlson coordinate (.CRD) File edit box and choose the coordinate (.CRD) file to send. Then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Before clicking the OK button for range of points, go to the Surveyor's Assistant and hit the GO function key. The Surveyor's Assistant is now waiting to receive so return to Carlson and click OK on the range of point dialog. The file transfer should now go.


Surveyor's Assistant Data Collection
Select
Select
Select
Download (Receive Surveyor's Assistant File)
Upload (Send Carlson CRD File)
Convert RAW (Surveyor's Assistant to Carlson)
Exit
Help

Surveyor's Assistant File

Carlson CRD File

Carlson RW5 File

Horizontal Angle Format
● Decimal Degrees ○ DD.MMSS

Port
● COM 1
○ COM 2
○ COM 3
○ COM 4
○ COM 5
○ COM 6

Baud
○ 1200
○ 2400
○ 4800
● 9600

Parity
● None
○ Odd
○ Even

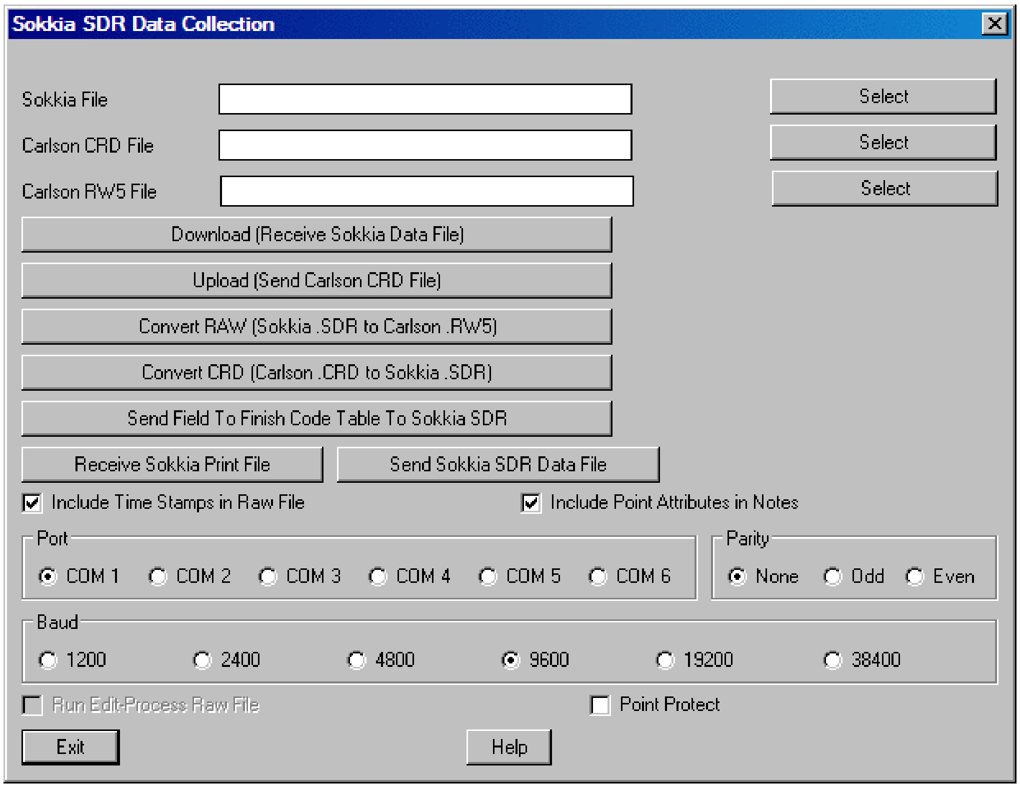
☐ Run Edit-Process Raw File
☑ Point Protect

Sokkia SDR

This routine applies to the Sokkia SDR-20, SDR-22, SDR-31 and SDR-33 as well as other collectors that have SDR format transfer such as the Trimble and C & G.

Download
From the SDR data collector, go to the Communications routine from the main menu. Choose Data Format SDR. Next hit the Send function key. Then choose Select Jobs. From the list of jobs, highlight the job to transfer and set it to Yes with the arrow keys. Now in Carlson, run *Data Collection* in the Survey menu and choose Sokkia/SDR. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to SDR and press OK. The file transfer should now go. The SDR format contains both coordinate and raw data. The coordinate data is converted to a Carlson coordinate (.CRD) file and the raw data is converted to a Carlson raw data (.RW5) file. The original SDR transfer file is stored on the computer as a RAW file. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

The SDR-33 has different modes for storing and transferring data. In coordinate mode, the download will create points in the coordinate (.CRD) file and the raw data (.RW5) file will only contain some basic header lines. In the raw data mode, the download will create all the measurement data in the raw file and no points will be created in the coordinate (.CRD) file. For this raw data mode, you will need to run *Edit-Process Raw Data File* in the Survey menu to calculate the points from the raw data. The third mode in the SDR-33 creates both raw data in the raw data (.RW5) file and points in the coordinate (.CRD) file. The Include Time Stamps in Notes option sets whether all the date-time records for each point are put in the raw data (.RW5) file as description records. The Include Point Attributes in Notes option will store SDR code 13(AT) codes to the point note (.NOT) for the coordinate (.CRD) file.


Sokkia SDR Data Collection
Sokkia File
Carlson CRD File
Carlson RW5 File
Select
Select
Select
Download (Receive Sokkia Data File)
Upload (Send Carlson CRD File)
Convert RAW (Sokkia .SDR to Carlson .RW5)
Convert CRD (Carlson .CRD to Sokkia .SDR)
Send Field To Finish Code Table To Sokkia SDR
Receive Sokkia Print File
Send Sokkia SDR Data File
Exit
Help

☑ Include Time Stamps in Raw File
☑ Include Point Attributes in Notes

Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6

Parity: ● None ○ Odd ○ Even

Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600 ○ 19200 ○ 38400

☐ Run Edit-Process Raw File
☐ Point Protect

Upload
Point data from the Carlson coordinate (.CRD) file can be uploaded into the SDR. First go to the Communications routine on the SDR main menu. Choose Data Format SDR. Go back to Carlson and choose Sokkia/SDR from the *Data Collection* command in the Survey menu. Check that the COM port and baud rate are set correctly. In the Carlson dialog, pick the Select File button next to the Carlson CRD File edit box and choose the coordinate (.CRD) file to send. Then click the Upload button. Then a Sokkia Options dialog appears for setting the job parameters for the file to be created on the collector. Be sure to choose the Distance Unit that matches your coordinate (.CRD) file (meters, US feet or international feet). Click OK and the next dialog now allows you to specify the range of point numbers to upload. Before clicking the Start Transfer button for range of points, go to the SDR and hit the Receive function key. The SDR is now waiting to receive so return to Carlson and click Start Transfer on the range of point dialog. The file transfer should now go.

Communication Settings
Besides matching the baud rate between Carlson and the collector, make sure that the collector is set to word length of 8 and 1 stop bit under the communication settings.

Print File
The Receive Sokkia Print File downloads a print report from the SDR33 data collector. This file is only used for printing report purposes in Carlson. This file is not used by Carlson to generate coordinate (.CRD) files or raw files. The first step is to choose Data format=Printed in the Communications menu of the SDR33. Next pick the Receive Print File button in Carlson. Then on the SDR33 choose the Send function and select a job to send. At this point the file is transferred. After downloading, the job report is displayed in the Carlson standard report viewer.

Example of Sokkia Printed Format:

```
SDR33 V04-04.25 (C) Copyright 1998 Sokkia May-29-80 23:39 01/29/1999
                Angle Degrees        Dist Feet
              Temp Farenht         Coord N-E-Elev
JOB               TRAV                Point Id Alpha (14)
            Atmos crn No          C and R crn No
         Record elev Yes       Sea level crn No
POS TP 1       North 10050.000      East 10000.000        Elev 0.000
POS TP 2       North 10000.000      East 10000.000        Elev 0.000
POS TP 3       North 9515.636       East 9551.975         Elev 37.611
              Code T3
POS TP 403   North 4967.527       East 5074.632         Elev 0.000
NOTE TS        Jan-01-80 00:14
** End of report **
```

Sokkia G2 This routine takes you directly to the SurvCOM dialog, similar to the Carlson SurvCE process.

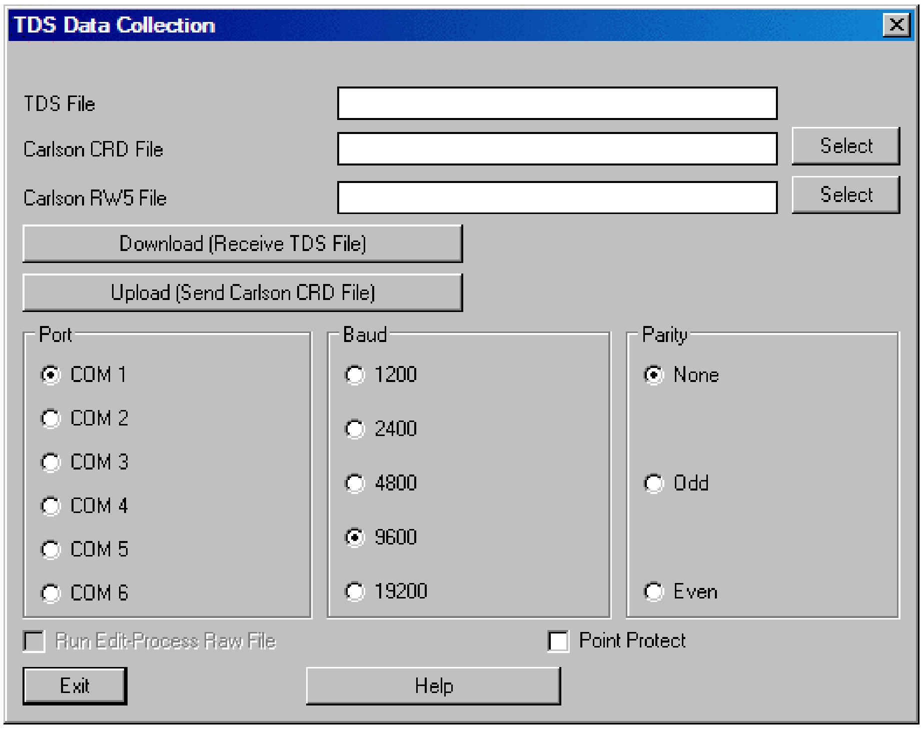
TDS

Download [HP-48 and Husky]

In the TDS program, go to the File Transfer routine. Choose the type of data to transfer (CRD or RAW). Next pick the Send function key. Stop here on the TDS and go to Carlson to run *Data Collection* in the Survey menu and pick TDS. Make sure that the COM port and baud rate are set correctly. Then pick the Download button. The Carlson program will now wait to receive the TDS file. Within 10 seconds select the file to send on the TDS. The file should be transferred now. When the transfer is complete, the program will ask you for the Carlson file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Download [Ranger and Windows CE]

In the TDS program, go to the Transfer routine and pick the Send File function. Set the "Connecting To" field to HP-48. Make sure that the COM port, baud rate and parity are set correctly and then pick OK. In the Type field of the file selection dialog, choose Coordinate Files or Raw Files. Stop here on the TDS and go to Carlson to run *Data Collection* in the Survey menu and pick TDS. Make sure that the COM port and baud rate are set correctly. Then pick the Download button. The Carlson program will now wait to receive the TDS file. Within 10 seconds select the file to send on the TDS and pick OK in the TDS dialog. The file should be transferred now. When the transfer is complete, the program will ask you for the Carlson file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.



Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6

Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600 ○ 19200

Parity: ● None ○ Odd ○ Even

☐ Run Edit-Process Raw File

☐ Point Protect

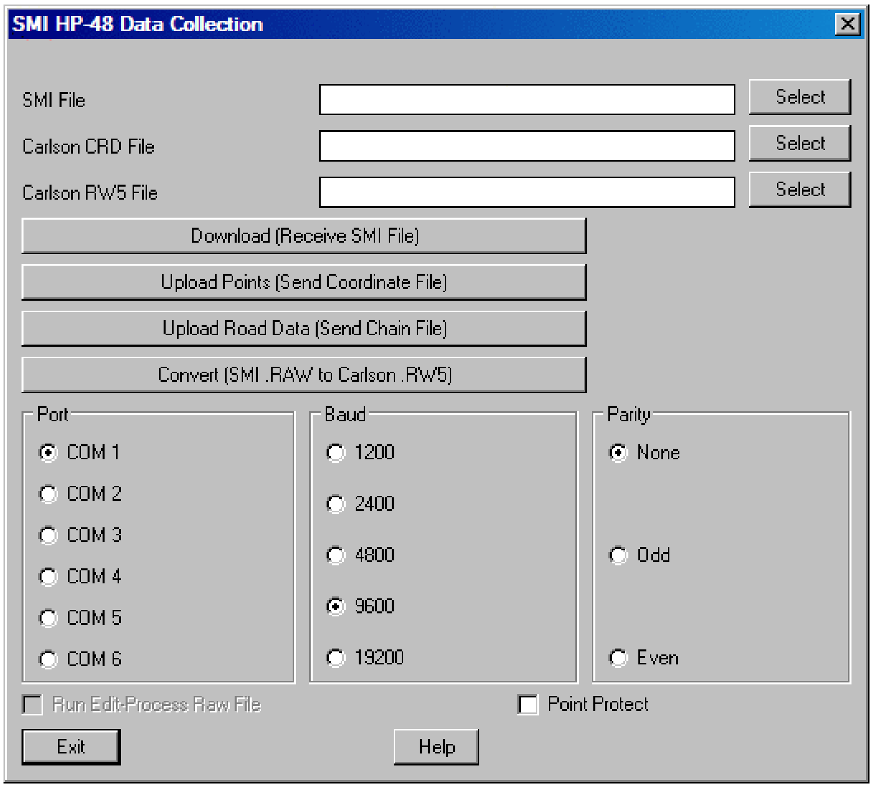
Upload [HP-48 and Husky]
A Carlson coordinate (.CRD) file can be converted to a CR5 file and uploaded into TDS. Start in the TDS program, by going to the File Transfer routine. Then move back to Carlson and run *Data Collection* in the Survey menu and pick TDS. In the Carlson dialog, enter a TDS File name. This name should not include the drive and directory path or file extension. For example, if the coordinate (.CRD) file is c:\scadxml\data\simo2.crd then the TDS File name could be just SIMO2. Next pick the Select File button next to the Carlson coordinate (.CRD) File edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Now pick the Carlson Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the range of points but before clicking the Start Transfer button go to TDS and hit the Receive function key. Within 10 seconds go back and click the OK button on the range of points. The file should then transfer.

Upload [Ranger and Windows CE]
A Carlson coordinate (.CRD) file can be converted to a CR5 file and uploaded into TDS. Start in the TDS program, by going to the Transfer routine and pick the Receive File function. Set the "Connecting To" field to HP-48. Make sure that the COM port, baud rate and parity are set correctly and then pick OK. Then move back to Carlson and run *Data Collection* in the Survey menu and pick TDS. In the Carlson dialog, enter a TDS File name. This name should not include the drive and directory path or file extension. For example, if the coordinate (.CRD) file is c:\scadxml\data\simo2.crd then the TDS File name could be just SIMO2. Next pick the Select File button next to the Carlson coordinate (.CRD) file edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Now pick the Carlson Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the range of points and click the Start Transfer button.

SMI

Download
To send point data from the SMI data collector, go to the file transfer routine by typing [More] [NXT] [TOPC] [COMM]. In SMI version 6 or later, type [Job][KERM][SEND]. Also in version 6, make sure that the first function key reads [NE] and not [XY] in the [Job][KERM] screen. Otherwise the coordinate northing and easting will be reversed. The [NE] stands for North-East coordinate order which is the format that Carlson expects. Also in the [Job][KERM] screen, make sure that the second function key reads [COMM] and not [SPACE]. The [COMM] stands for comma separators. Then enter the first point to send followed by the last point to send but before pressing Enter for the last point go to Carlson. Run *Data Collection* in the Survey menu and choose SMI. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to SMI and press Enter for the last point to send. The file transfer should now go. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector. To send raw data, use the [Print][Raw] routine in SMI along with the same Carlson procedure used for point data.

Upload
From the SMI data collector, go to the file transfer routine by typing [More] [NXT] [TO48] [COMM]. In SMI version 6 or later, type [Job][KERM][RECV]. Also in version 6, make sure that first function key reads [NE] and not [XY] in the [Job][KERM] screen. Otherwise the coordinate northing and easting will be reversed. Then enter the first point to send followed by the last point to send. Next enter the job name but before pressing Enter go to Carlson and run SMI under *Data Collection* in the Survey menu. In the Carlson dialog, specify the same job name as entered in SMI. Next pick the Select File button next to the Carlson CRD File edit box and choose the coordinate (.CRD) file to send. Check that the COM port and baud rate are set correctly. Then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the same range of points as entered on the SMI. Go back to SMI and hit Enter for job name followed by clicking the OK button for range of points in Carlson. The file transfer should now go.



SMI HP-48 Data Collection

SMI File Select

Carlson CRD File Select

Carlson RW5 File Select

Download (Receive SMI File)

Upload Points (Send Coordinate File)

Upload Road Data (Send Chain File)

Convert (SMI .RAW to Carlson .RW5)

Port
● COM 1
○ COM 2
○ COM 3
○ COM 4
○ COM 5
○ COM 6

Baud
○ 1200
○ 2400
○ 4800
● 9600
○ 19200

Parity
● None
○ Odd
○ Even

☐ Run Edit-Process Raw File
☐ Point Protect

Exit Help

Leica

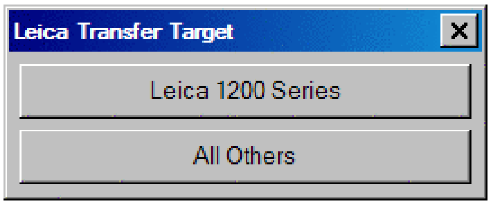
There are two types of Leica transfers: GIF-10 and GeoCom for all other Leica instruments. The type is set in the Equipment Type field on the main dialog. For transferring with the Leica instruments, the GeoCom program shows a dialog of the available COM ports on your computer. On the first time that you transfer to an instrument, you will need to pick the Instruments button and register the instrument from the list. Pick the Port Settings button to make sure that the communication settings match the instrument.

To download a file with GeoCom, make sure that the instrument is ON and connected to the computer by serial cable. The instrument also needs to be in GeoCom mode. Then pick the Download in the Carlson dialog. In the GeoCom program, open the computer COM port that the instrument is connected to by picking the '+'. Then open the Memory Card and GSI folders. Next select the file to transfer and click the OK button. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

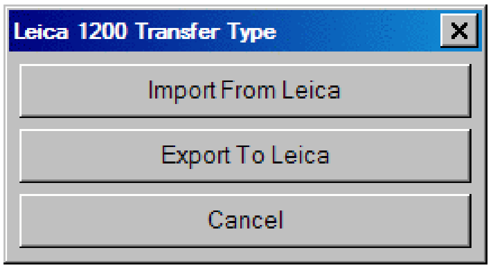
To upload a file with GeoCom, specify the file name to be created on the instrument in the Leica File field and pick the Upload button in the Carlson dialog. Then the program will prompt for the range of points to transfer. Fill out the range and pick the Start Transfer button. Then the GeoCom program will start. Open the computer COM port by picking the '+'. Then open the Memory Card folder and highlight the GSI folder and click OK.

The upload and download file transfer works with the GIF-10 data collector. The GIF-10 communication settings should be the following:

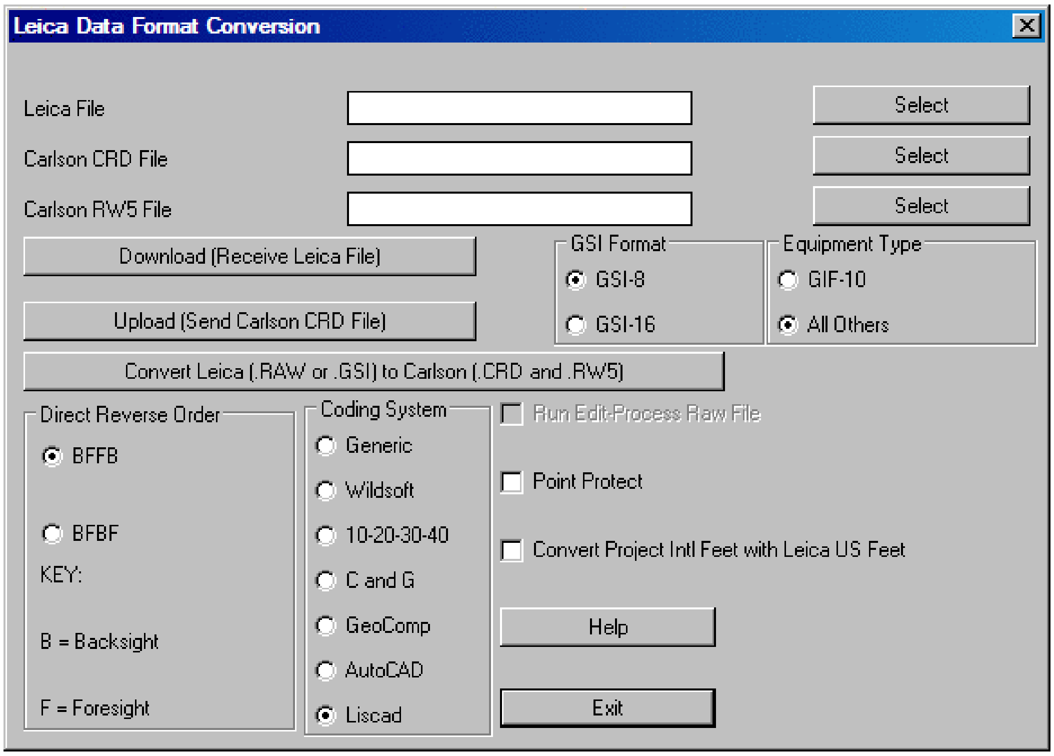
Baud: 9600
Parity: NONE
Protocol: NONE
Stop Bit: 1
End Mark: CR/LF
Connected As: Some computers use DCE and others use DTE


Leica Transfer Target
Leica 1200 Series
All Others

First Leica dialog


Leica 1200 Transfer Type
Import From Leica
Export To Leica
Cancel

When Leica 1200 Series is chosen


Leica Data Format Conversion
Leica File
Carlson CRD File
Carlson RW5 File
Select
Select
Select
Download (Receive Leica File)
Upload (Send Carlson CRD File)
Convert Leica (.RAW or .GSI) to Carlson (.CRD and .RW5)
Help
Exit

GSI Format
● GSI-8
○ GSI-16

Equipment Type
○ GIF-10
● All Others

Direct Reverse Order
● BFFB
○ BFBF
KEY:
B = Backsight
F = Foresight

Coding System
○ Generic
○ Wildsoft
○ 10-20-30-40
○ C and G
○ GeoComp
○ AutoCAD
● Liscad

☐ Run Edit-Process Raw File
☐ Point Protect
☐ Convert Project Intl Feet with Leica US Feet

All others

Download
From the GIF-10, go to the file transfer routine. Then go to Carlson and run *Data Collection* in the Survey menu and choose Leica. Check that the COM port and baud rate are set correctly. Then click the Download button and within 10 seconds go back to GIF-10 and select the file to send. The file transfer should now go. When the transfer is complete, the program will ask you for the Carlson coordinate (.CRD) file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload
From the GIF-10 data collector, go to the file transfer routine. Then go to Carlson and run Leica under *Data Collection* in the Survey menu. In the Carlson dialog, specify the job name in the Leica File field. Next pick the Select File button next to the Carlson coordinate (.CRD) File edit box and choose the coordinate (.CRD) file to send.

Check that the COM port and baud rate are set correctly. Then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Before clicking the OK button for range of points, go to GIF-10 and start the receive by highlighting Receive and pressing the Run button. The GIF-10 now shows the available job numbers. Choose a job to receive the transfer using the arrow buttons and then press the Run button.

Converting

Carlson supports raw and coordinate data collected using three different Leica Operation Codes: Wildsoft and 10-20-30-40 as well as the newer LISCAD. Moreover, data could be in the GSI8 format or the newer GSI16 format. Some example files are shown here.

GSI8 format data file using LISCAD Operation codes:

```
WILD GIF-12
410149+00000001 42....+00005003 43....+00005.42 44....+00005.25 45....+00005000
110150+00005000 21.324+35959480 22.324+09238590 31..01+00228271
410151+00000005 42....+00010100
110152+00005001 21.324+35156390 22.324+09303500 31..01+00133532
410153+00000005 42....+00070100
410154+00000014 42....+00000ELM
110155+00007082 21.324+34739450 22.324+09322050 31..01+00137685
410156+00000005 42....+00070102
```

GSI16 format data file using LISCAD Operation codes:

```
∗110001+0000000000000001 84..11+0000010000000000 85..11+0000003000000000
86..11+0000000001000000 87..11+0000000000005170
∗410002+0000000000000009 42....+0000000000000001 43....+000010000000.000 44....+000003000000.000
45....+000000001000.000
∗410003+0000000000000001 42....+0000000000000001 43....+000000000005.330 44....+000000000000.000
∗410004+0000000000000004 42....+00000000178.1530
∗410005+0000000000000003 42....+0000000000000002 43....+0000000000000001
∗110006+00000000000000RO 21.324+0000000017815300 22.324+0000000008424260
31..01+0000000000000000
∗410007+0000000000000100
∗410008+0000000000000012 42....+000000000005.090
∗110009+0000000000000002 21.324+0000000000831230 22.324+0000000008130270
31..01+0000000000089996
∗110010+0000000000000002 21.324+0000000018831230 22.324+0000000027829250
31..01+0000000000089996
∗110011+00000000000000RO 21.324+0000000035815170 22.324+0000000027539300
31..01+0000000000000000
```

GSI8 format data file using Wildsoft Operation codes:

```
410001+00000001 42....+00000013 43....+00000000 44....+00000012 45....+00981101
410002+00000002 42....+00000013 43....+00005.42 44....+00000012 45....+00000000
410003+00000032 42....+00000500 43....+00004.26 44....+00000012 45....+00000000
410004+000000TP 42....+00000000 43....+00000000 44....+00000000 45....+00000000
110005+00000501 21.124+00000000 22.104+09136260 31...1+00000000 51..0.+0012+000
110006+00000502 21.124+03741320 22.104+08915570 31...1+00246818 51..0.+0012+000
110007+00000503 21.124+03915180 22.104+08919040 31...1+00251956 51..0.+0012+000
110008+00000504 21.124+06530420 22.104+08839360 31...1+00113998 51..0.+0012+000
```

Leica raw files usually have a .RAW or .GSI extension. The primary difference in the GSI8 and GSI16 formats is that information is contained in data blocks of 16 characters in the GSI16 format, while it is contained in blocks of 8 characters in the GSI8 format. Leica instruments make it possible to have both the GSI8 as well as GSI16 data formats in the same raw file. However, lines with the GSI16 format data will always start with an asterisk (∗) character, to distinguish them from the GSI8 format. There is no distinction between Leica raw files collected in the Wildsoft and LISCAD operation codes.

Supported LISCAD codes:
1: New instrument setup
2: New target height
3: Sets of directions
4: Fixed azimuth
5: Feature code
6: Measured offset
8: Line creation for sub-codes 1 (straight string), 2 (curved string) and 6 (arc by 3 points)
9: Fixed coordinates
11: Close string
14: Additional description
20: Start of job
27: Feature code
90: Split feature code
100+: Descriptions

The Convert button can be used to convert any Leica format file into a Carlson format file. For example, if you have a Leica PCMCIA card then there is no serial cable transfer to do. Instead use the Convert routine to make the Carlson raw data (.RW5) and coordinate (.CRD) files. Since there is no distinction between Wildsoft and LISCAD files, the user must know in advance which format has been used in the file. Then, select that particular option (Wildsoft, 10-20-30-40 or LISCAD) under the "Coding System" option at the bottom of the dialog box, as shown in the previous page. Another option that the user needs to choose is the order in which foresight-backsight readings have been recorded in the raw file, BFFB or BFBF, as explained in the dialog box. Then, the user can simply pick the "Convert" button and the program prompts for the input" Wild/Leica File" (raw file), and the output" Carlson RW5 file" and "Carlson CRD file", if they are not already filled.

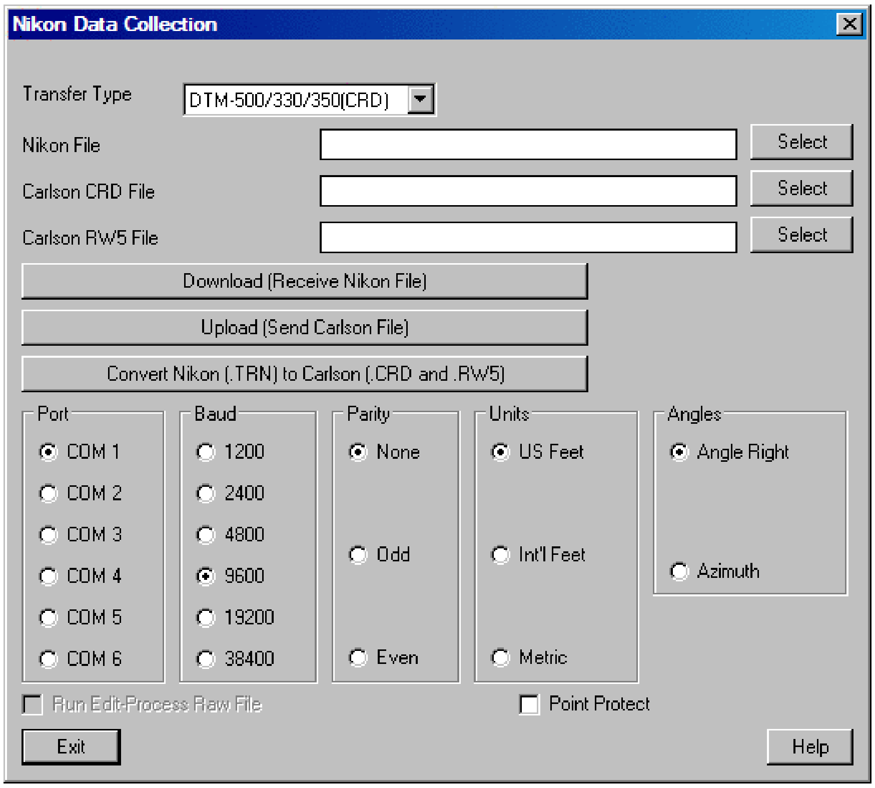
Nikon

Download

First choose the equipment and data type under the Transfer Type list. Also check that the communication and data format settings match your collector. Then click the Download button and follow the on-screen directions. When the transfer is complete, the program will ask you for the Carlson coordinate file (.CRD) and raw file (.RW5) to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector. The original data from the collector is stored in a file name with the same name as the coordinate file except with a .TRN extension. For example, job5.crd would have job5.trn.

Upload

Pick the Select File button next to the Carlson CRD File edit box and choose the CRD file to send. Check that the COM port and baud rate are set correctly and then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Set the points and then click the Start Transfer button. The file transfer should now go.


Nikon Data Collection
Select
Select
Select
Download (Receive Nikon File)
Upload (Send Carlson File)
Convert Nikon (.TRN) to Carlson (.CRD and .RW5)
Exit
Help

Transfer Type: DTM-500/330/350(CRD)

Nikon File:

Carlson CRD File:

Carlson RW5 File:

Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6

Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600 ○ 19200 ○ 38400

Parity: ● None ○ Odd ○ Even

Units: ● US Feet ○ Int'l Feet ○ Metric

Angles: ● Angle Right ○ Azimuth

☐ Run Edit-Process Raw File

☐ Point Protect

Convert Nikon to Carlson
The Convert button will translate the Nikon raw file format (.TRN or .RAW) into Carlson coordinate (.CRD) and raw (.RW5) files.

Portion of typical Nikon file format:

```
MP,1,,5000.0000,5000.0000,0.0000,T/1
CO,31-Oct-1999 11:42:38
ST,1,,2,,0.0000,0.00000,0.00000
SS,3,0.0000,152.1510,359.59590,90.44100,11:43:38,T/2
SS,4,0.0000,127.5560,0.06040,90.40110,11:44:45,CON
SS,5,0.0000,97.1820,2.19580,90.52460,11:45:43,CON
```

Geodimeter

Download

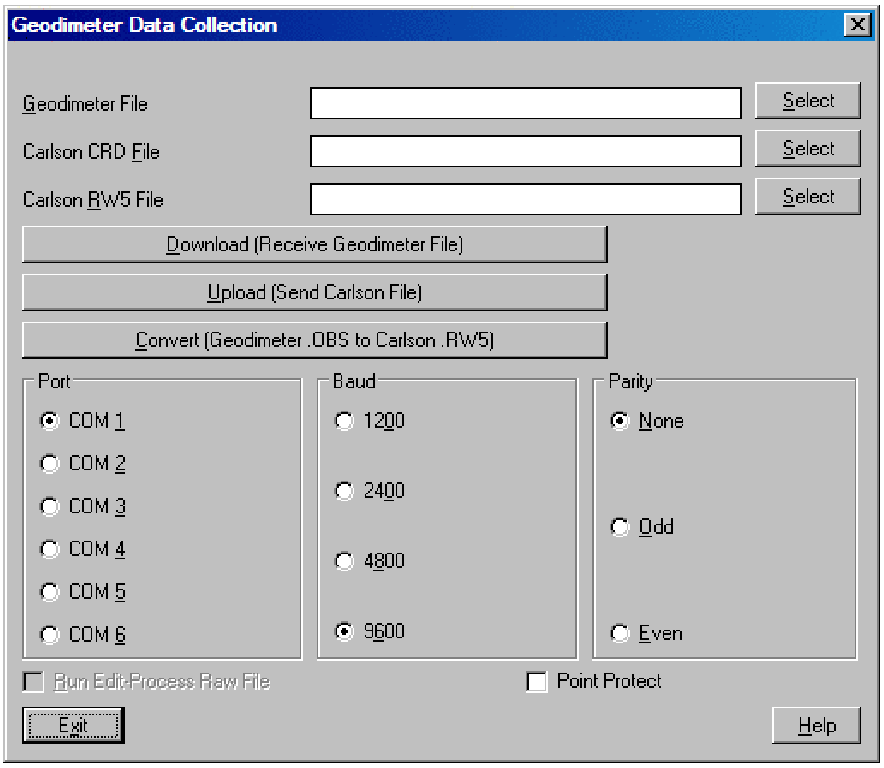
From the Geodimeter data collector, go to the file transfer routine by pressing the PRG (Program) key and entering program 54. Then choose Imem (option 1) as the source. Next choose the file type to send as either Job (measurement data) or Area (point data). The Geodimeter will then prompt for the job name. Next enter Serial (option 3) as the destination. A confirmation screen appears showing the serial port settings. Here are some typical settings:

COM=1,8,0,9600

Before pressing enter (ENT key), go to Carlson and run *Data Collection* in the Survey menu and choose Geodimeter. Then click the Download button and within 15 seconds, go back to the Geodimeter and press Enter. The file transfer should now go. When the transfer is complete, the program will ask you for the Carlson coordinate file and raw file to create if you haven't already specified a file name in the dialog. With Point Protect on, the routine will check the coordinate file for existing point data before downloading the point from the data collector.

Upload

In Carlson, run Geodimeter under *Data Collection* in the Survey menu. Pick the Select File button next to the Carlson CRD File edit box and choose the CRD file to send. Check that the COM port and baud rate are set correctly and then click the Upload button. A dialog now allows you to specify the range of point numbers to upload. Enter the points to send but before clicking OK, go to the Geodimeter data collector. Start the file transfer routine by pressing the PRG key and entering program 54. Then choose Serial (option 3) as the source. The Geodimeter will display the serial port settings. Check these values and press enter. Next choose Area (option 2) as the destination. Then enter the job name. The Geodimeter is now listening for data. Quickly go back to Carlson and click OK on the points to send dialog. The file transfer should now go



Geodimeter Data Collection

Geodimeter File

Carlson CRD File

Carlson RW5 File

Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6

Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600

Parity: ● None ○ Odd ○ Even

☐ Run Edit-Process Raw File

☐ Point Protect

Select
Select
Select
Download (Receive Geodimeter File)
Upload (Send Carlson File)
Convert (Geodimeter .OBS to Carlson .RW5)
Exit
Help

Convert

The Convert button will translate the Geodimeter raw file format (.OBS) into Carlson coordinate (.CRD) and raw (.RW5) files.

Communication Settings

If the Geodimeter is not communicating with Carlson, run function 79 on the Geodimeter and make sure that it is set to 4. This setting is for the transfer message end of sequence format.

Supported Geodimeter Codes

The following Geodimeter codes are processed when converting the Geodimeter raw file. All other codes are recorded as descriptions in the Carlson rw5 file.

0=Info
1=Data
2=Station No
3=Instrument Height
4=Point Code
5=Point Number
6=Signal Height
7=Horizontal Angle
8=Vertical Angle
9=Slope Distance
11=Horizontal Distance
17=Horizontal Angle
18=Vertical Angle

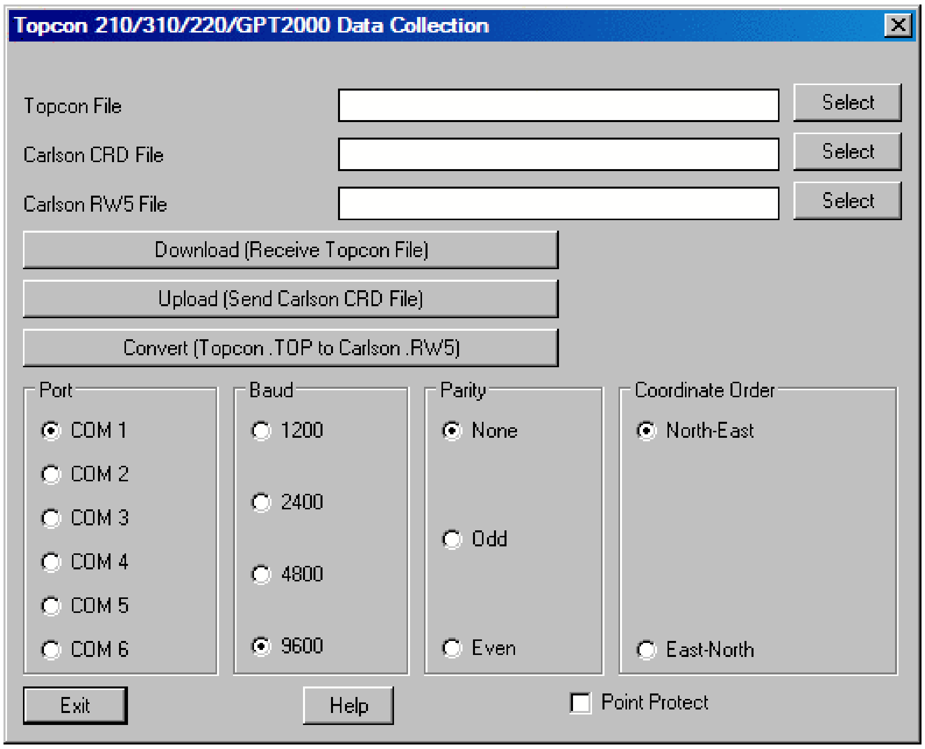
21=Horizontal Reference Angle
30=Atmospheric Correction
37=Northing
38=Easting
39=Elevation
40=Delta North
41=Delta East
42=Delta Elevation
45=Correction To Bearing
46=Standard Deviation
50=Job Number
51=Date
52=Time
53=Operator
54=Project Id
55=Instrument Id
56=Temperature
60=Shot Id
61=Activity Code
62=Reference Object
70=Entered Radial Offset
71=Entered Angle Offset
72=Calculated Radial Offset
73=Calculated Angle Offset
74=Air Pressure

Portion of typical Geodimeter file format

```
5=108
4=13POC
6=5.000
7=238.0708
8=89.2236
9=440.39
37=767.42
38=4626.07
39=699.795
```

Topcon 210/310/220/GPT2000

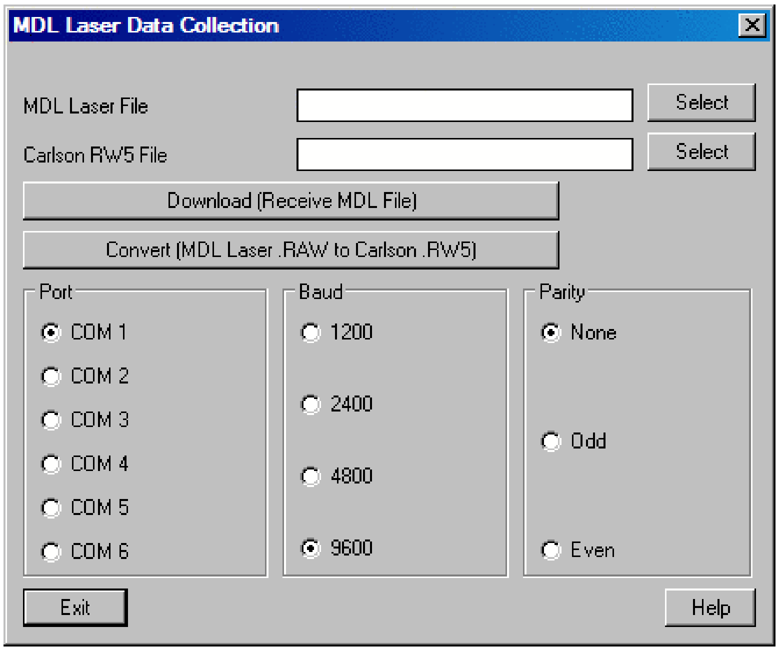
This command supports these above Topcon models.


Topcon 210/310/220/GPT2000 Data Collection
Topcon File
Select
Carlson CRD File
Select
Carlson RW5 File
Select
Download (Receive Topcon File)
Upload (Send Carlson CRD File)
Convert (Topcon .TOP to Carlson .RW5)
Exit
Help

Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6
Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600
Parity: ● None ○ Odd ○ Even
Coordinate Order: ● North-East ○ East-North
☐ Point Protect

MDL Laser

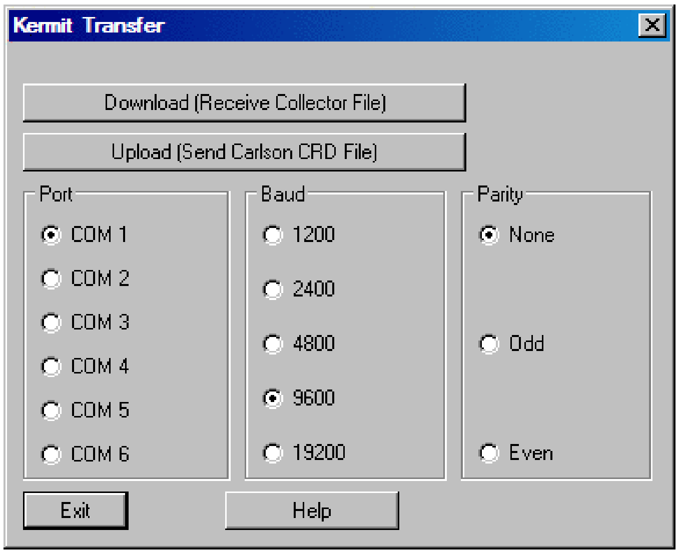
The MDL Laser outputs a raw file of angles, distances and codes as one long string of data which can be converted into a Carlson raw data (.RW5) file. There is no coordinate data in the MDL raw file. So you need to run *Edit-Process Raw File* to calculate coordinates from the raw data. The Download button will transfer the MDL raw data from a BDI logger.


MDL Laser Data Collection
MDL Laser File
Select
Carlson RW5 File
Select
Download (Receive MDL File)
Convert (MDL Laser .RAW to Carlson .RW5)
Exit
Help

Port: ● COM 1 ○ COM 2 ○ COM 3 ○ COM 4 ○ COM 5 ○ COM 6
Baud: ○ 1200 ○ 2400 ○ 4800 ● 9600
Parity: ● None ○ Odd ○ Even

Kermit

Kermit can be also used for transfering files with accuracy. The dialog looks like this:


Kermit Transfer
Download (Receive Collector File)
Upload (Send Carlson CRD File)
Port
● COM 1
○ COM 2
○ COM 3
○ COM 4
○ COM 5
○ COM 6
Baud
○ 1200
○ 2400
○ 4800
● 9600
○ 19200
Parity
● None
○ Odd
○ Even
Exit
Help

Keyboard Command: datacolt
Prerequisite: None

Convert LDD-AEC Contours

This command allows you to convert LandDesktop contours (known as AECC_CONTOUR objects) into polylines. You must have the AEC Object Enabler installed before using this command. If you do not have the object enabler installed, download the latest version from www.autodesk.com.

You can use the *List* command to determine if contours are polylines or AECC_Contour objects. Here is an example listing:

AECC_CONTOUR Layer: "CONT-MJR"

Space: Model space

Handle = 429

Major Contour Interval

Elevation: 1005.00

Smoothing: None

Number of Vertices: 48

Open

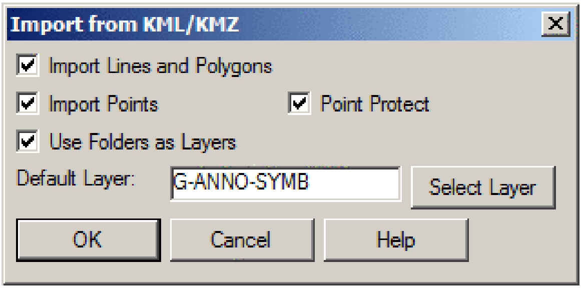
Length: 560.25

Constant width: 0.00

Style Name: Standard

Import Google Earth File

The Import Google Earth File command allows you to insert a KML (Keyhole Markup Language or alternatively a KMZ) file of points (KML *Placemark*), polylines (KML *Path*) and closed polylines (KML *Polygon*) into your drawing. Throughout this discussion, *KML* will be used to also describe KMZ files unless explicitly noted.



Import Lines and Polygons: When this option is selected, KML Path and Polygon entries will be placed into the drawing as open or closed polylines, respectively.

Import Points: When this option is selected, KML Placemark entries will be placed into the drawing and active coordinate file.

Point Protect: When enabled, existing points in the active coordinate file will not be over-written.

Use Folders as Layers: When enabled, KML Folder entries will be used to create layer names in CAD and the supported KML options described above will be placed onto the layer that conforms the the Folder to which they belong.

Default Layer: The supported KML options described above that are not contained in a KML folder will be placed into the specified layer.

Note:

- Placemarks, paths or polygon entries that have an altitude value specified will be imported at the proper "Z" elevation in the CAD drawing.
- KML or KMZ files can be specified for the import process.

Prompts

Google Earth File to Read: *Select a previously saved KML or KMZ file.*

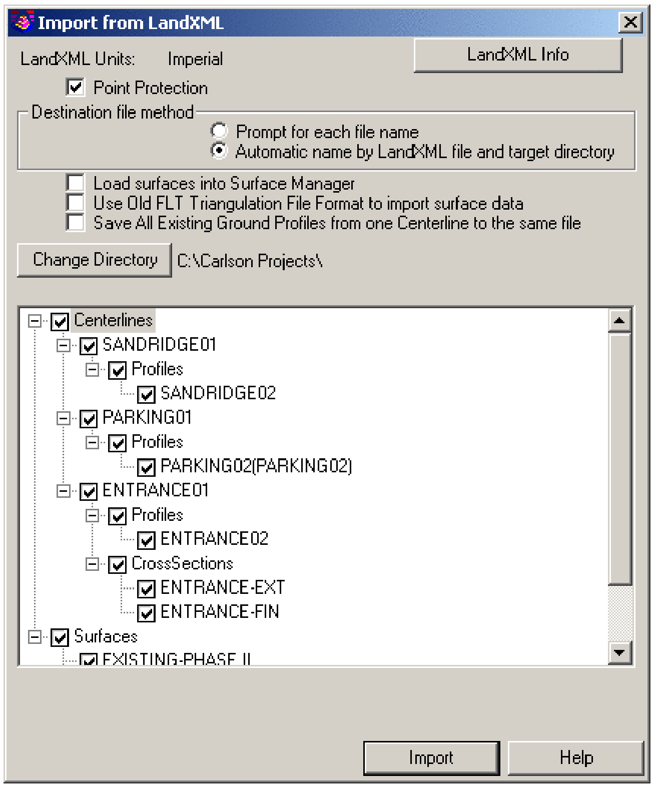
- To import a Google Earth image into your drawing, use the Place Google Earth Image command.
- To import a Google Earth terrain data into a Carlson TIN (surface model), use the Place Google Earth Image command.
- To export content from your drawing to a KML file, use the Export Google Earth File command.

Pulldown Menu Location: File > LandXML/RoadXML/Google Earth
Keyboard Command: kmlread
Prerequisite: A KML or KMZ file with Placemark, Path and/or Polygon information, an active coordinate file with an established projection zone through Drawing Setup.

Import LandXML File

The Import LandXML File routine provides a mechanism where land-based data from other software applications (including Carlson Software) can be brought into a project and used for analysis and/or design purposes. To import a LandXML file, a series of dialog boxes are presented:

Select LandXML File: Specify the name of a LandXML file you wish to import.



LandXML Units: Imperial

☑ Point Protection

Destination file method
○ Prompt for each file name
● Automatic name by LandXML file and target directory

☐ Load surfaces into Surface Manager
☐ Use Old FLT Triangulation File Format to import surface data
☐ Save All Existing Ground Profiles from one Centerline to the same file

C:\Carlson Projects\

- ☑ Centerlines
  - ☑ SANDRIDGE01
    - ☑ Profiles
      - ☑ SANDRIDGE02
  - ☑ PARKING01
    - ☑ Profiles
      - ☑ PARKING02(PARKING02)
  - ☑ ENTRANCE01
    - ☑ Profiles
      - ☑ ENTRANCE02
    - ☑ CrossSections
      - ☑ ENTRANCE-EXT
      - ☑ ENTRANCE-FIN
- ☑ Surfaces
  - ☑ EXISTING-PHASE II

LandXML Units: Indicates the Units of Measure associated with the incoming LandXML file (see the Unit Differences item below).

Point Protection: When enabled, you are prompted for a course of action if an existing LandXML file you've selected contains COGO points that have the same number(s) as those that already exist in the drawing. When disabled, existing point data in the project is updated with the values from the LandXML file.

Destination File Method: This option allows you to indicate how the incoming data file(s) are named as they are imported.

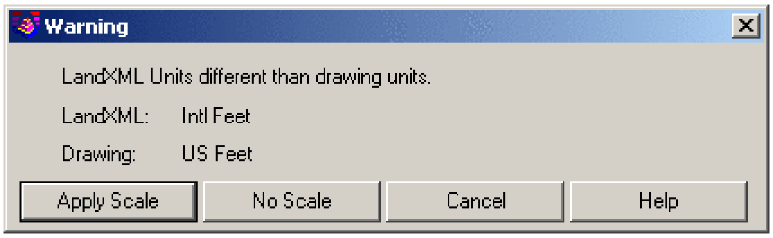
Load Surfaces into Surface Manager: When enabled, this option will automatically add surface model (TIN) data into the Surface Manager and graphically represents (draws) the surface model/contours according to the current settings found in the Triangulate & Contour command.

Use Old FLT Triangulation File Format to Import Surface Data: When enabled, the older ASCII-based Carlson ∗.FLT file format will be used in place of the newer and more efficient ∗.TIN file format.

Save All Existing Ground Profiles from One Centerline to the Same File: When enabled, collections of existing ground profiles associated with a particular centerline are combined into a single ∗.PRO file.

Change Directory: This option allows you to adjust the folder location where the new data files will be written.

Import from LandXML: Enable or disable various entries that should used to produce the data files found within the LandXML file.

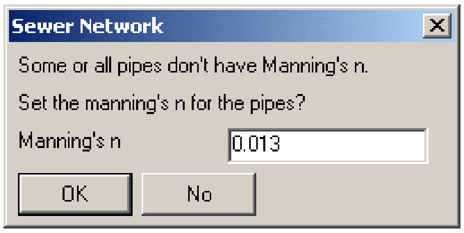


LandXML Units different than drawing units.

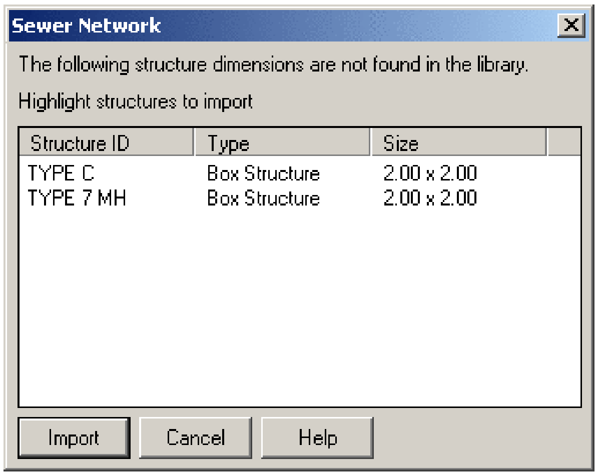
LandXML: Intl Feet

Drawing: US Feet

Unit Differences: If the Units of Measure specified in the LandXML file are different than those found in Drawing Setup, you will be prompted for a course of action.


Sewer Network
Some or all pipes don't have Manning's n.
Set the manning's n for the pipes?
Manning's n
0.013
OK
No

Manning's "n": If you are importing sewer data from a LandXML file and if the LandXML file does not carry Manning's "n" values, you will be prompted to specify a default Manning's "n" value for all incoming sewer entities that don't already have a Mannings "n" value.


Sewer Network
The following structure dimensions are not found in the library.
Highlight structures to import
Import
Cancel
Help

Structure ID	Type	Size
TYPE C	Box Structure	2.00 x 2.00
TYPE 7 MH	Box Structure	2.00 x 2.00

Import Structures: If you are importing sewer data from a LandXML file and structure values specified in the LandXML file do not exist in the Structure Library, you will be prompted to indicate the structure(s) that should be imported into the Structure Library. Use standard Windows **click**, **shift+click** and/or **ctrl+click** functionality to select multiple structures at the same time.

Skip Invisible Triangles: This option applies to importing TIN surfaces from Civil 3D. When this option is active, triangles marked by Civil 3D as invisible or excluded are not imported.

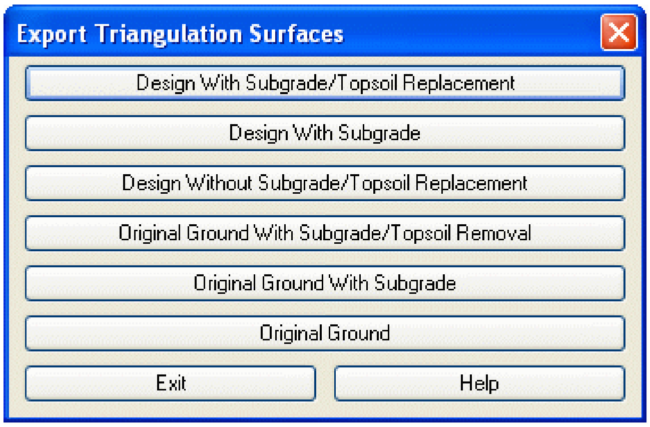
Note:

- The LandXML initiative is being driven by the land development industry as an acceptable means to share and transfer land data rather than the traditional graphical representation of that data. It also provides an effective means for transferring a variety data (points, centerlines, profiles, surface models, sewer data, *etc*). Another advantage of LandXML is that the LandXML data structure is CAD and software vendor neutral (meaning you don't have to own or use the CAD or software product used by your data provider).
- Visit http://www.landxml.org for additional information on the uses and acceptance of the LandXML initiative.

Pulldown Menu Location(s): File > LandXML
Keyboard Command: landxml_import
Prerequisite: A LandXML file to import

Import/Export Carlson Triangulation Files

Import Carlson Triangulation Files allows you to import an external surface file into TakeOff to use as a named surface. Export Carlson Triangulation Files allows you to take a Surface Triangulation file and save it independent of the drawing.


Export Triangulation Surfaces
Design With Subgrade/Topsoil Replacement
Design With Subgrade
Design Without Subgrade/Topsoil Replacement
Original Ground With Subgrade/Topsoil Removal
Original Ground With Subgrade
Original Ground
Exit
Help

Prerequisite: .TIN or .FLT files

Keyboard Command: import_tin, export_tin

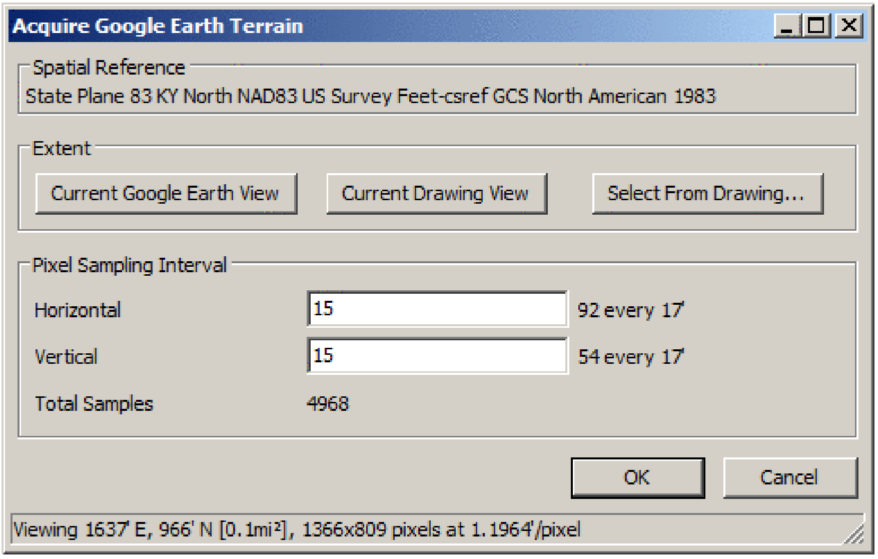
Import Google Earth Surface

In addition to providing a graphical method for displaying feature-rich data located anywhere on the globe, Google Earth also provides the ability for software applications to extract its underlying terrain data. While the elevational accuracy of the Google Earth surface should be considered extremely coarse, it might be suitable for large-scale watershed modeling studies, preliminary land-planning studies or "proof-of-concept" preliminary designs.

When extracting terrain data from Google Earth, it is important to keep "diminishing returns" in mind. As an example, a land surveyor might perform a traditional grid-based topographic survey by sampling the land every 50 feet. Although a 25 foot grid spacing would yield more accurate results than a 50 foot grid, it would typically take at least twice as long to survey. Harvesting terrain data from Google Earth operates in a similar fashion:

1. The Google Earth "project area" is identified and the limits of the site are calculated
2. Horizontal and vertical "sample" intervals are established
3. Terrain data is gathered at each identified sample location and used to form a surface model

Consider the following example. Based on the physical screen size of the Google Earth application and the "zoom" (or "view") resolution of a project site, the following values (summarized at the bottom of the dialog box) were returned:


Acquire Google Earth Terrain
Extent
Current Google Earth View
Current Drawing View
Select From Drawing...
Pixel Sampling Interval
OK
Cancel

Spatial Reference
State Plane 83 KY North NAD83 US Survey Feet-csref GCS North American 1983

Horizontal 15 92 every 17'
Vertical 15 54 every 17'
Total Samples 4968

Viewing 1637' E, 966' N [0.1mi^2], 1366x809 pixels at 1.1964'/pixel

Unit	Horizontal	Vertical
Feet	1637	966
Pixels	1366	809
Feet/Pixel	1.19	1.19

Google Earth View Area

In the sample above, the total area is calculated and displayed (0.1 mi^2) along with the desired "projection" system for our project site. Although it might be desired to sample every pixel in this project... **1,107,270** = (1366+1)$*$(809+1), in all, the "point of diminishing return" would be quickly reached and could clog Google servers with extraneous terrain requests; see the **NOTE** section below.

Spatial Reference: Displays the spatial reference coordinate projection system of the current drawing. The projection can be set using the Drawing Setup command.

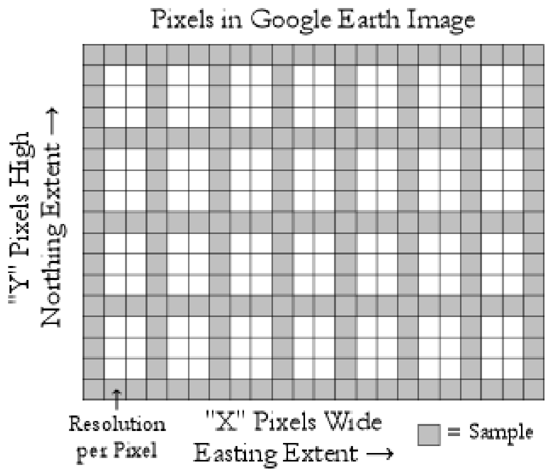
Extent - Current Google Earth View: Gets the overall dimensions of the Google Earth session and displays the results in both pixels and the appropriate units of measure.

Extent - Current Drawing View: Gets the overall dimensions of the current CAD view and displays the results in both pixels and the appropriate units of measure.

Extent - Select from Drawing: Sets the overall dimensions of the Google Earth session to conform with a drawing window from CAD and displays the results in both pixels and the appropriate units of measure.

Pixel Sampling Interval: Allows the ability to indicate how often a pixel row or column should be sampled for terrain elevation. Smaller intervals result in higher total samples and longer processing time.

Consider the following "sample" diagram:


Pixels in Google Earth Image
"Y" Pixels High
Northing Extent →
Resolution per Pixel
"X" Pixels Wide
Easting Extent →
= Sample

Referring back to our horizontal and vertical samples shown in the dialog box above, we are requesting:

Requesting	Horizontal	Vertical
Pixel Interval	15	15
Samples	92 = Int(1366/15)+1	54 = Int(809/15)+1
Sample Every	17 ft (approx.) = Int(1637/92)	17 ft (approx.) = Int(966/54)

Google Earth Sampling

The resulting total samples 4968 = (92)∗(54) and it is recommended that this value be at or below the Google Earth session threshold of 5000.

Note:

- In an effort to protect their servers from abuse, Google will rapidly return ***5,000*** sample requests *per Google Earth **session*** and then "throttle down" the remaining sample requests to about 1 per second. In the example above but with a sample interval of 1H and 1V, the terrain surface would be completed in a little over 12 days, 18 hours. For this reason, it is strongly suggested that the horizontal and vertical sampling intervals be set so that the sample result is at or below the 5000 sample threshold.
- The Import Google Earth Surface routine fetches terrain data in real-time from the Google servers and requires an Internet connection to proceed. In the event that an Internet connection is not available, the following error message may be displayed: "*Failed to initialize Google Earth. Please ensure Google Earth client software is functional and online*"
- It bears repeating that the terrain data returned by Google Earth should only be used for illustrative or proof-of-concept purposes only!

- To import a Google Earth image into your drawing, use the Place Google Earth Image command.
- To import KML content into your drawing, use the Import Google Earth File command.
- To export content from your drawing to a KML file, use the Export Google Earth File command.

Prompts

Identify first corner: *Identify one corner of a drawing window that should be used to set the Google Earth display*
Identify opposite corner: *Identify the opposite corner of a drawing window that should be used to set the Google Earth display*

Pulldown Menu Location: Civil > Surface > Import/Export Surface, Survey > Surface > Import/Export Surface, Takeoff > Tools > Import/Export, Construction > Import/Export
Keyboard Command: gesurface
Prerequisite: Coordinate projection system, Functioning version of Google Earth with Terrain enabled, Internet connection

Import/Export DXF Files

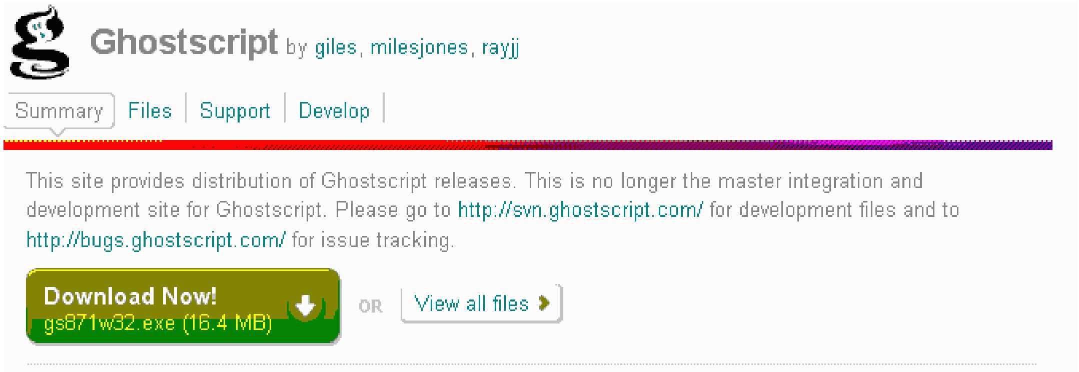
Import DXF File allows you to import an external DXF file into the Carlson TakeOff drawing (DWG). Export DXF File exports selected entities from the Carlson TakeOff drawing (DWG) to a DXF file. The DXF file is another format for the drawing objects of the DWG file. Typically, other CAD programs at least support DXF files if they don't support DWG. So the DXF file (Drawing eXchange File) can be used to transfer drawing data between Carlson Takeoff and other non-DWG programs.

Prerequisite: a DXF file

Keyboard Command: _dxfin, _dxfout

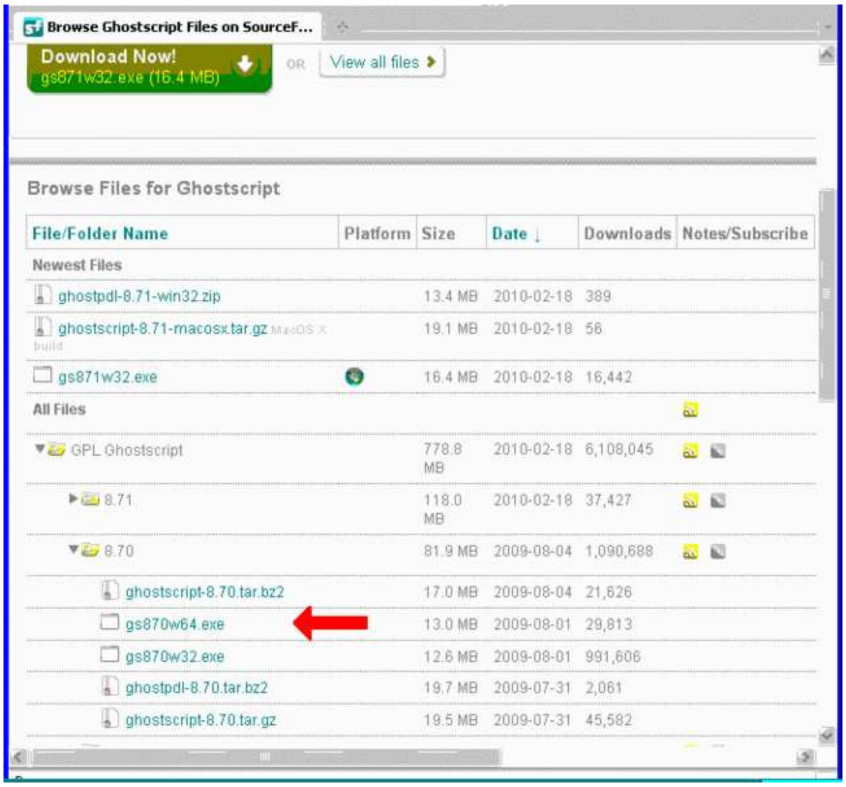
Import PDF File

This command allows you to bring in a Adobe .PDF file and covert it into polylines or a .bmp image. In order for this command to work you need to download and install Ghostscript from the website http://sourceforge.net/projects/ghostscript/. For 32-bit computers you'll want to download gs(xxx)w32.exe by clicking on the "Download Now!" button located on the main page.


Ghostscript by giles, milesjones, rayjj
Summary
Files
Support
Develop
Download Now!
gs871w32.exe (16.4 MB)
OR
View all files

This site provides distribution of Ghostscript releases. This is no longer the master integration and development site for Ghostscript. Please go to http://svn.ghostscript.com/ for development files and to http://bugs.ghostscript.com/ for issue tracking.

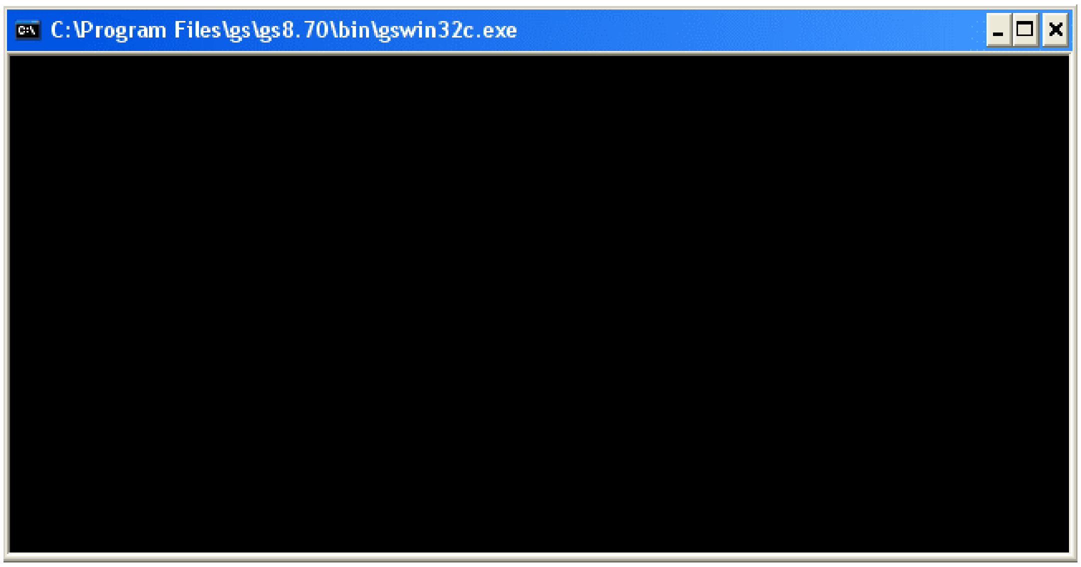
If gs(xxx)w32.exe is not listed under "Download Now!" or you are running a 64-bit computer, click on the "View all files" button to the right of the "Download Now!" button. A list of Ghostscript versions will appear below (i.e., 8.71, 8.70). After downloading the .exe to your computer double click on it to install.


Browse Ghostscript Files on SourceF...
Download Now!
gs871w32.exe (16.4 MB)
OR
View all files

Browse Files for Ghostscript

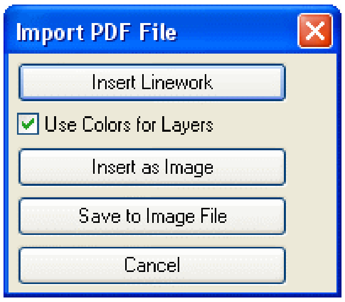
File/Folder Name	Platform	Size	Date ↓	Downloads	Notes/Subscribe
Newest Files					
ghostpdl-8.71-win32.zip		13.4 MB	2010-02-18	389	
ghostscript-8.71-macosx.tar.gz MacOS X build		19.1 MB	2010-02-18	56	
gs871w32.exe		16.4 MB	2010-02-18	16,442	
All Files					
GPL Ghostscript		778.8 MB	2010-02-18	6,108,045	
8.71		118.0 MB	2010-02-18	37,427	
8.70		81.9 MB	2009-08-04	1,090,688	
ghostscript-8.70.tar.bz2		17.0 MB	2009-08-04	21,626	
gs870w64.exe		13.0 MB	2009-08-01	29,813	
gs870w32.exe		12.6 MB	2009-08-01	991,606	
ghostpdl-8.70.tar.bz2		19.7 MB	2009-07-31	2,061	
ghostscript-8.70.tar.gz		19.5 MB	2009-07-31	45,582	

Ghostscript is a free software and should only take a few minutes to install. Once it is installed, Carlson Takeoff will automatically utilitize this software when you run Import PDF file. After selecting the file you want to insert, the below window will open.


C:\Program Files\gs\gs8.70\bin\gswin32c.exe

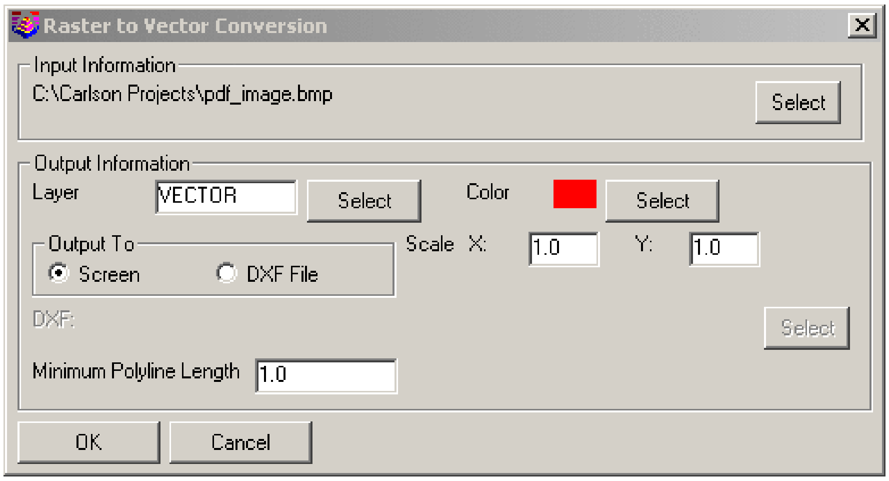
Wait for the window to close on its own (closing this window on your own will exit the command).

Next you will be prompted for Insert as Image, Insert Linework, Save to Image File. Insert as Image will convert the PDF into a .bmp image that is inserted into the drawing. When inserted, a .bmp image is visible on the screen, but unusable as CAD linework. Save to Image File simply saves the .bmp file without inserting it into the drawing. Insert Linework will convert the PDF file into usable CAD polylines and Use Colors for Layers will parcel out the polylines onto layers based on the colors or gray scale of the PDF.


Import PDF File
Insert Linework
Insert as Image
Save to Image File
Cancel

☑ Use Colors for Layers

If the PDF you are converting is a raster image, an not a vector PDF, then you will receive this additional dialog:


Raster to Vector Conversion
Input Information
Select
Output Information
Select
Select
Output To
DXF:
Select
OK
Cancel

C:\Carlson Projects\pdf_image.bmp

Layer VECTOR

Color 🟥

● Screen ○ DXF File

Scale X: 1.0 Y: 1.0

Minimum Polyline Length 1.0

In this dialog, you can specify the Layer, Color, Scale, and whether to draw the entities on the screen or write a .dxf file. Minimum Polyline Length will reduce the amount of line segments created from the conversion.

When you are inserting the converted PDF into the drawing, will you receive the following prompts:

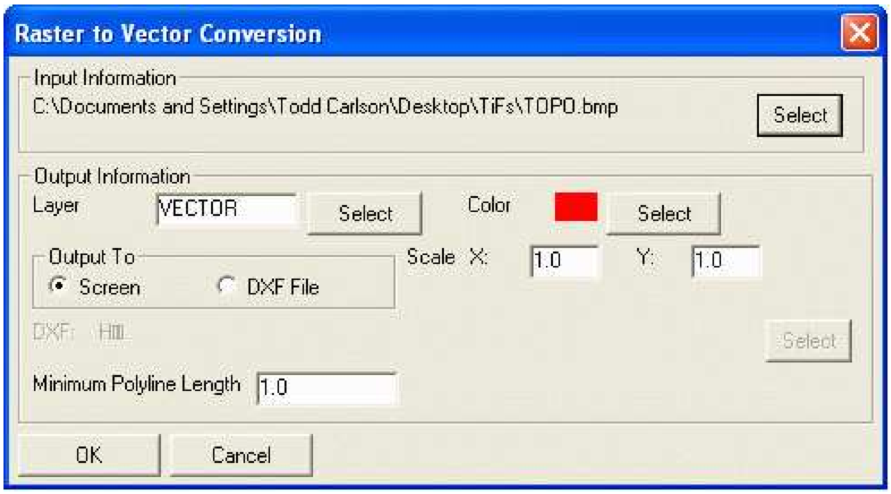
Pick point to insert PDF: Specify the insertion point for the PDF converted linework by either picking on the screen or typing in a coordinate (Example: 1000,1000).
Specify rotation angle: To accept the default value displayed, press Enter, or enter the rotation angle (Example: 90).
Specify scale <1.0>: To accept the default value displayed, press Enter, or enter a scale factor. If the scale factor is not known, which is typical, accept the defaults to this prompt. The proper scale factor can be determined by running Inquiry>Standard Distance on a known distance on the site (ie, the side of a building or the distance across the road). If the side of a building is labeled as 60' and Standard Distance reports it is at 120', then the Scale factor is 0.5 (60/120). Run Edit>2D Scale, select the imported objects, specify a base point of 0,0 and use the Scale Factor you determined with Standard Distance to scale the entities correctly.

After the command has imported the PDF file, run View > Zoom > Extents to see the converted entities.

Pulldown Menu Location: Tools > Import/Export
Prerequisite: a PDF file, Ghostscript installed
Keyboard Command: loadpdf

Import Raster To Vector

This command allows you to bring in a monochrome .bmp image and covert it into polylines. To process other file types, such as .tif or .jpeg, open the image up in Microsoft Paint and Save As the file as a monochrome .bmp. In the dialog below, you can specify the Layer, Color, Scale, and whether to draw the entities on the screen or write a .dxf file. Minimum Polyline Length will reduce the amount of line segments created from the conversion.


Raster to Vector Conversion

Input Information
C:\Documents and Settings\Todd Carlson\Desktop\TiFs\TOPO.bmp

Output Information
Layer: VECTOR
Color: 🟥
Output To: ● Screen ○ DXF File
Scale X: 1.0 Y: 1.0
DXF: Hill
Minimum Polyline Length: 1.0

Keyboard Command: ras2vec
Prerequisite: a monochrome .bmp file

Import Polyline File

Function

This command draws polylines from the selected polyline file. These polylines are drawn in the current layer. This command supports the following formats: Carlson (.PLN), Idan (.DIS), MicroStation (.TXT), MOSS (.INP, .PRN) and Topcon Pocket 3D (.TXT).

Prompts

Polyline file format [<Carlson>/DTM/Idan/MicroStation/MOSS/Topcon]? *press Enter to accept Carlson*
Polyline File to Read Dialog *select existing .PLN file*

Keyboard Command: polydraw
Prerequisite: A polyline file

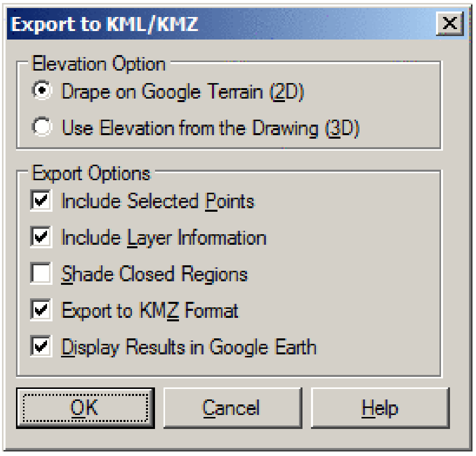
Import/Export Trimble TTM File

These commands convert between Trimble TTM format triangulation files and Carlson format. First you select the source file to read and then the destination file to write.

Pulldown Menu Location: Surface->Import/Export Surface
Keyboard Command: ttm2tin, tin2ttm
Prerequisite: File to convert

Export Google Earth File

The Export Google Earth File allows you to produce a KML (Keyhole Markup Language or alternatively a KMZ) file of Carlson points, lines, arcs and polylines for rendering in other mapping and GIS applications such as Google Earth. Throughout this discussion, *KML* will be used to also describe KMZ files unless explicitly noted.


Export to KML/KMZ

Elevation Option
● Drape on Google Terrain (2D)
○ Use Elevation from the Drawing (3D)

Export Options
☑ Include Selected Points
☑ Include Layer Information
☐ Shade Closed Regions
☑ Export to KMZ Format
☑ Display Results in Google Earth

Drape on Google Terrain (2D): When this option is selected, entities written to the KML file will have an Altitude setting of "Clamped to ground."

Use Elevations from the Drawing (3D): When this option is selected, entities written to the KML file will have an Altitude setting of "Absolute."

Include Selected Points: When enabled, this option exports selected Carlson point information to the KML <Placemark><Point>...</Point></Placemark> tag structure.

Include Layer Information: When enabled, this option organizes exported information based on the layer of each entity, with each CAD layer becoming a KML <Folder>...</Folder> entry with the color of the group taking the general color of the CAD layer.

Shade Closed Regions: When enabled, all closed polyline regions (*e.g.* building pads, ponds, *etc*) will be fill-shaded.

Export to KMZ Format: When enabled, the KML file is written to the more compact (zipped) KMZ version of the standard KML file format.

Display Results in Google Earth: When enabled, the results of the KML are passed to and automatically opened with Google Earth.

Note:

- When the *Use Elevations from the Drawing (3D)* option is selected, be aware that elevation values lower than the Google Earth terrain may be obstructed in the Google Earth display.
- Attribute information (*e.g.* Number, Elevation, Description) of selected Carlson points are also written to the KML and will display in the "balloon" when a point is picked in the Google Earth display or data hierarchy.
- When the *Shade Closed Regions* toggle is enabled, note that **all** closed polyline regions will become fill shaded and may lead to undesired results for items such as closed contours.
- When prompted for the name of the KML/KMZ file to write, the appropriate KML or KMZ file extension based on the *Export to KMZ Format* toggle will be added to the file if the file extension is not specified.
- Arcs and polylines with arcs are converted into chord segments that closely approximate the arc(s).
- Other entities not supported for direct export to a KML file (*e.g.* circles, 3DFaces, ellipses, splines, multilines, regions and solids), can be first turned into polylines with the Entities to Polylines command. Text entities can be converted to polylines through the use of the Text Explode To Polylines command.
- The graphical symbology of any/all items sent to the KML file can be manually modified via the Google Earth interface.

Prompts

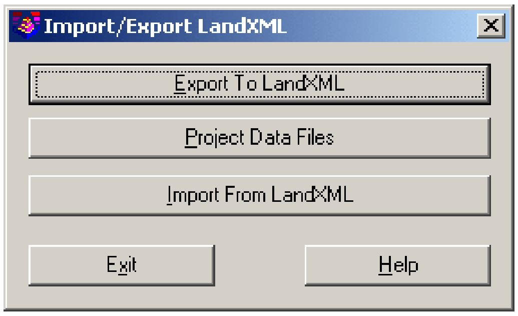
Select points, polylines, lines and arcs to write.
FILter/<Select entities>: *Select the desired entities and press Enter when complete.*

- To import a Google Earth image into your drawing, use the Place Google Earth Image command.
- To import a Google Earth terrain data into a Carlson TIN (surface model), use the Place Google Earth Image command.
- To import KML content into your drawing, use the Import Google Earth File command.

Pulldown Menu Location: File > LandXML/RoadXML/Google Earth
Keyboard Command: kmlwrite
Prerequisite: Points, lines or polylines in the drawing with an established projection zone through Drawing Setup.

Export LandXML File

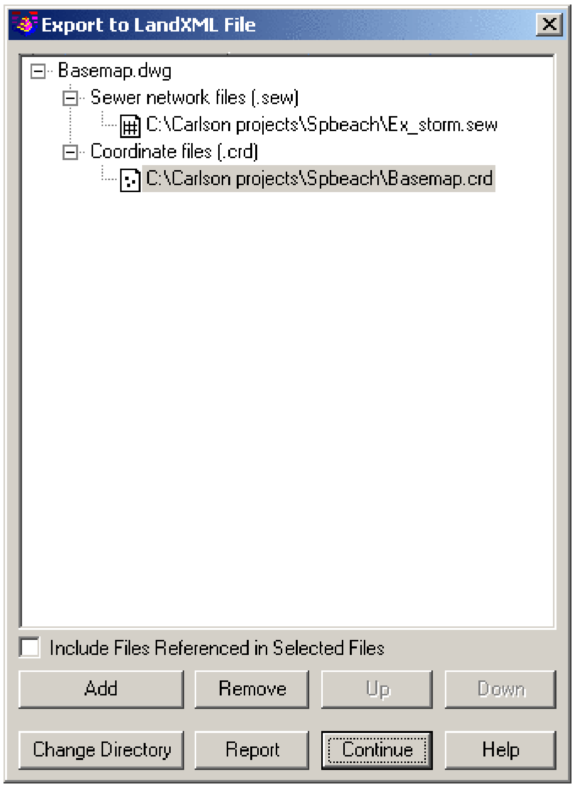
The Export LandXML File routine provides a mechanism where data can be sent from Carlson Software into a LandXML file for use in other applications that support the LandXML data specification. To generate a LandXML file, a series of dialog boxes are presented:



Export to LandXML: This option allows you to individually select the desired Carlson Software data file(s) that should be included in the LandXML file.

Project Data Files: This option allows you to quickly select the various data files associated with, and defined by a Carlson Project (∗.prj) file.

Select LandXML File: Specify the name of a LandXML file you wish to create.


Export to LandXML File

- Basemap.dwg
  - Sewer network files (.sew)
    - C:\Carlson projects\Spbeach\Ex_storm.sew
  - Coordinate files (.crd)
    - C:\Carlson projects\Spbeach\Basemap.crd

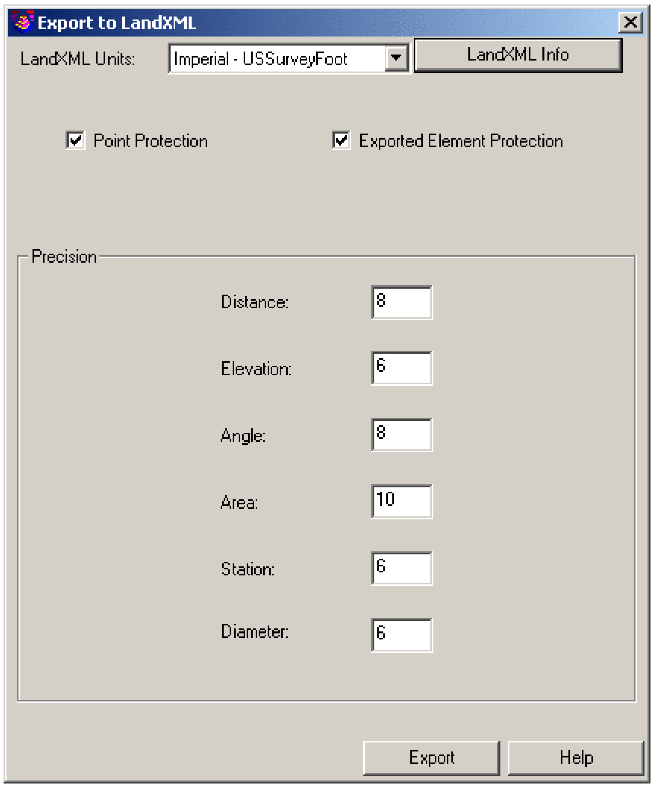
☐ Include Files Referenced in Selected Files

Include Files Referenced in Select Files: When enabled, this option will automatically add other files that are referenced by the selected file. As an example, the file produced by the Carlson Road Network command references TINs, Centerlines, Profiles, *etc*, and adding the single Road Network file will also add the referenced file(s) into the Export to LandXML File dialog box.

Export to LandXML File: Add, remove (using standard Windows **click**, **shift+click** and/or **ctrl+click** functionality) or otherwise organize the data file(s) that is to be incorporated into the LandXML file.

Change Directory: This option allows you to adjust the folder location from where selected data files should be referenced (often used for project revision purposes).

Report: Create a report (suitable for file transmission or archival purposes) of the file(s) selected to be incorporated into the LandXML file.



LandXML Units: Imperial - USSurveyFoot

☑ Point Protection

☑ Exported Element Protection

Precision

Distance: 8

Elevation: 6

Angle: 8

Area: 10

Station: 6

Diameter: 6

LandXML Units: Specify the desired Units of Measure that reflect the outgoing data.

Point Protection: When enabled, you are prompted for a course of action if an existing LandXML file you've selected contains COGO points that have the same number(s) as those being selected for the LandXML file. When disabled, point data you've selected for the LandXML file are automatically written to (or updated into) the existing LandXML file.

Exported Element Protection: When enabled, you are prompted if existing data (such as a centerline) in a LandXML file should be updated with data of the same name that you have selected for the LandXML file.

Precision: Set the desired level of precision for each of the various measurement categories.

Profiles:

There are two major different types of profiles in LandXML: ProfSurf and ProfAlign. ProfSurf is typically an existing surface that is usually created using existing surface data. The data for this type of profile it is stored in a series of station-elevation values as a representation of a PntList2D list. ProfAlign is for a design profile. The data for this type of profile is stored in LandXML elements starting from the simplest one: PVI element, CircCurve element, ParaCurve element, etc.

Carlson differentiates the two types mentioned above by using the profile type in the Carlson .pro file: Generic = ProSurf, Road = ProAlign.

Note:

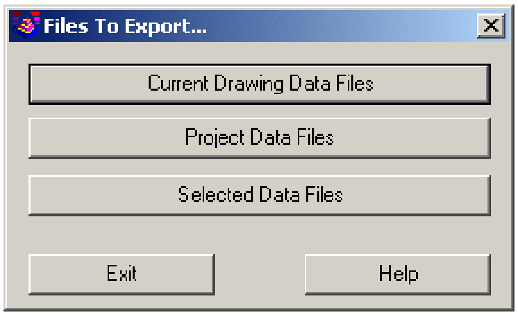
- The LandXML initiative is being driven by the land development industry as an acceptable means to share and transfer land data rather than the traditional graphical representation of that data. It also provides an effective means for transferring a variety data (points, centerlines, profiles, surface models, sewer data, *etc*). Another advantage of LandXML is that the LandXML data structure is CAD and software vendor neutral (meaning you don't have to own or use the CAD or software product used by your data provider).

- Visit http://www.landxml.org for additional information on the uses and acceptance of the LandXML initiative.

Pulldown Menu Location(s): File > LandXML
Keyboard Command: landxml_export
Prerequisite: Carlson project data files to convert

Export RoadXML File

The Export RoadXML File routine creates a RoadXML RXL file using Carlson format centerline and profile files. This RoadXML file can be used for data exchange with other applications that support the RoadXML data specification such as Trimble. To generate a RoadXML file, a series of dialog boxes are presented:

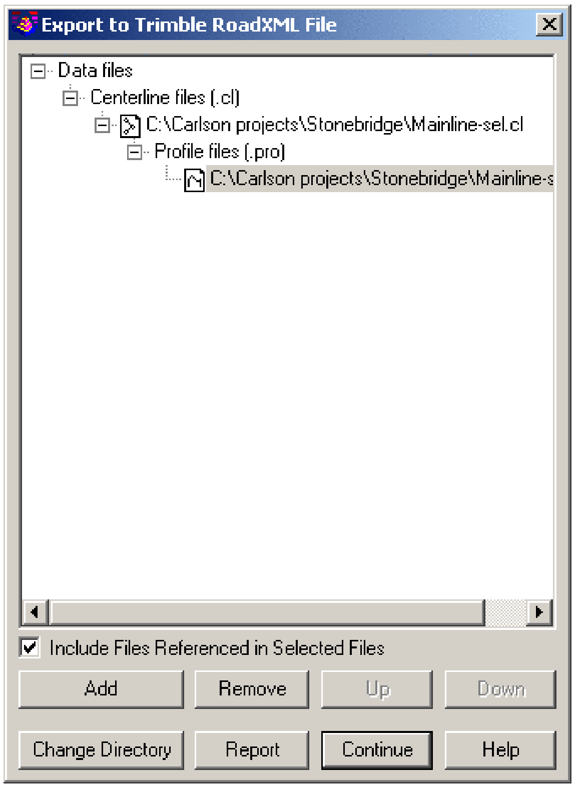


Current Drawing Data Files: This option selects the various data files associated with , and defined by the Drawing Explorer command.

Project Data Files: This option allows you to quickly select the various data files associated with, and defined by a Carlson Project (∗.prj) file.

Selected Data Files: This option allows you to individually select the desired Carlson Software data file(s) that should be included in the RoadXML file. This is followed by:

Select RoadXML File: Use the standard File Selector dialog box to specify a new or append to an existing RoadXML file. This is followed by:

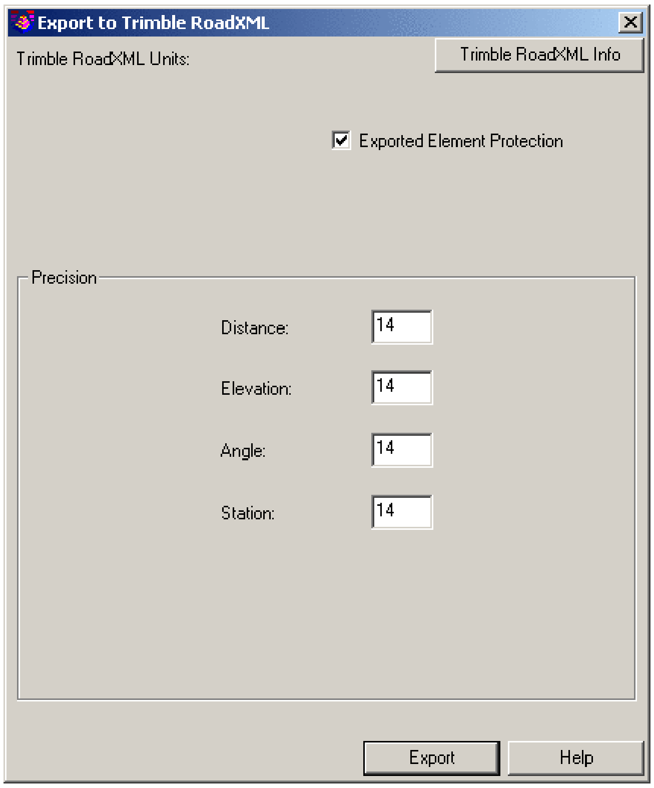

Export to Trimble RoadXML File
Data files
Centerline files (.cl)
C:\Carlson projects\Stonebridge\Mainline-sel.cl
Profile files (.pro)
C:\Carlson projects\Stonebridge\Mainline-s
☑ Include Files Referenced in Selected Files
Add
Remove
Up
Down
Change Directory
Report
Continue
Help

Include Files Referenced in Select Files: When enabled, this option will automatically add other files that are referenced by the selected file. As an example, the file produced by the Carlson Road Network command references TINs, Centerlines, Profiles, *etc*, and adding the single Road Network file will also add the referenced file(s) into the Export to RoadXML File dialog box.

Export to RoadXML File: Add, remove (using standard Windows **click**, **shift+click** and/or **ctrl+click** functionality) or otherwise organize the data file(s) that is to be incorporated into the RoadXML file.

Change Directory: This option allows you to adjust the folder location from where selected data files should be referenced (often used for project revision purposes).

Report: Create a report (suitable for file transmission or archival purposes) of the file(s) selected to be incorporated into the RoadXML file.


Export to Trimble RoadXML

Trimble RoadXML Units:

☑ Exported Element Protection

Precision

Distance: 14

Elevation: 14

Angle: 14

Station: 14

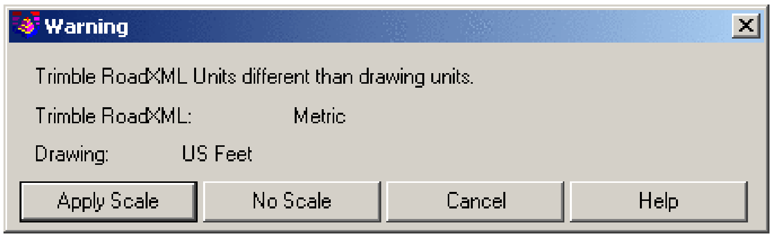
RoadXML Units: The Units of Measure are displayed for the RoadXML file about to be created.

Exported Element Protection: When enabled, you are prompted if existing data (such as a centerline) in a RoadXML file should be updated with data of the same name that you have selected for the RoadXML file.

Precision: Set the desired level of precision for each of the various measurement categories.

Pick the Export button to complete the creation of the RoadXML RXL file.

RoadXML Units: RoadXML files are always in metric units. If the current drawing units as set in Drawing Setup are not metric, then you will be prompted whether to apply a scale factor.


Warning

Trimble RoadXML Units different than drawing units.

Trimble RoadXML: Metric

Drawing: US Feet

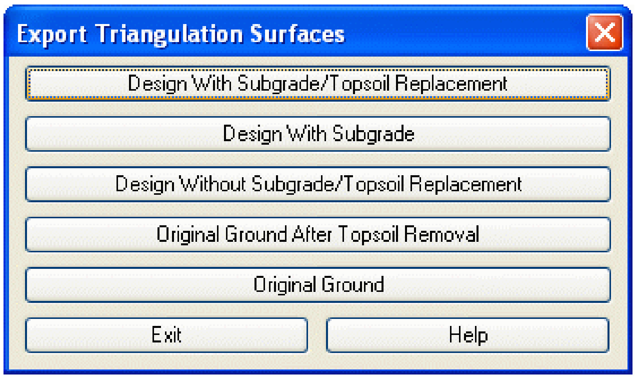
Indicate the desired action of what should occur if the units of the RoadXML do not match those of the current drawing.

Note: Visit http://www.road-xml.org for additional information on the RoadXML initiative.

Pulldown Menu Location(s): File > LandXML/RoadXML
Keyboard Command: roadxml_export
Prerequisite: Carlson project data files to convert

Export Surface DXF Files

Export Carlson Triangulation Files allows you to take a Surface file and save it as a DXF file. The DXF file will contain 3D Faces for the triangulation surface. This command is another way besides the LandXML routine to transfer a Carlson Takeoff surface to other programs.


Export Triangulation Surfaces
Design With Subgrade/Topsoil Replacement
Design With Subgrade
Design Without Subgrade/Topsoil Replacement
Original Ground After Topsoil Removal
Original Ground
Exit
Help

Prerequisite: .TIN or .FLT files

Keyboard Command: EXPORT_DXF

Export Polyline File

This command creates a polyline file that contains the point data of the select polylines. The objects supported by this tool include polylines, arcs and lines. If you want to include text, you must use the *Text Explode To Polylines* command found in the Edit menu to convert the text to polylines before running this command. This polyline file is a text file that has three formats. The Carlson format (.PLN) is used by machine control (Carlson Grade, Dozer 2000, GradeStar) for the plan view. Each polyline begins with a line of "POLYLINE, Color number". Then the points for the polyline are listed on separate lines in X,Y,Z format. Here is a list of the available color numbers:

0 = Black
1 = Blue
2 = Green
3 = Cyan
4 = Red
5 = Magenta
6 = Brown
7 = Light Gray
8 = Dark Gray
9 = Light Blue
10 = Light Green
11 = Light Cyan
12 = Light Red
13 = Light Magenta
14 = Yellow
15 = White

The MicroStation format (.txt) can be imported into MicroStation. This format has the coordinates as space delimited for each polyline point. There is an extra column with a 1 or 0 where 1 specifies the start of a new polyline. The DTM and Idan formats create linework files for the DTM and Idan programs.

Prompts

Polyline file format [<Carlson>/DTM/Idan/MicroStation]? *press Enter for Carlson format*
Specify File to Write dialog *create a new file or append to existing*
Polyline file for Grid File Utilities macro [Yes/<No>]? *press Enter* The option will write a polyline file that can

be used with Grid File Utilities for inclusion/exclusion perimeters.
Include Z coordinate in polyline file [Yes/<No>]? *press Enter* This option controls whether the polyline vertices are written in 2D or 3D.
Specify Exclusion/Warning Polylines [Yes/<No>]? *press Enter* This option applies to machine control for warning areas.
Specify WorkZone Polylines [Yes/<No>]? *press Enter* This option applies to machine control for working areas.
Reduce Polyline Vertices [<Yes>/No]? *press Enter* This option applies Reduce Polyline to the polyline vertices before writing the file.
Enter reduce offset cutoff <0.1>: *press Enter*
Decimal places for coordinates <2>: *press Enter*
Select polylines, lines and arcs to write.
Select objects: *pick the entities to process*
Done.

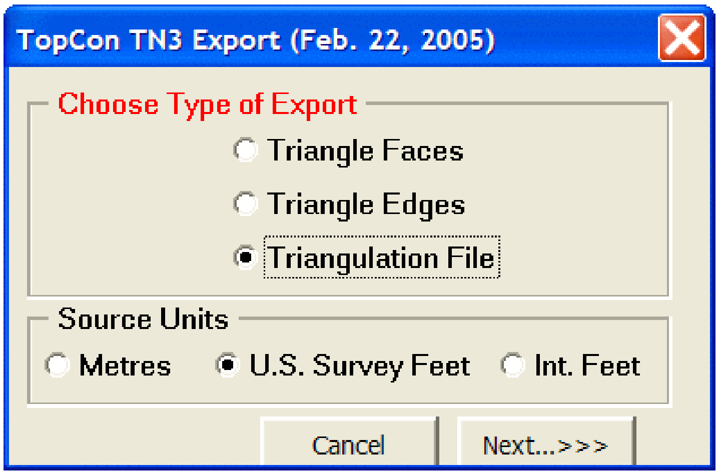
Sample Polyline File:

```
POLYLINE,15
47639.82,74540.11,0.00
47670.49,74565.79,0.00
47701.08,74591.49,0.00
49375.61,76358.47,0.00
50066.86,76846.75,0.00
POLYLINE,15
47633.24,74547.97,0.00
47663.90,74573.65,0.00
etc...
```

Keyboard Command: polywrite
Prerequisite: Polylines in the drawing

Export Topcon TIN File

This command writes a Topcon TIN file (.TN3) from a Carlson Takeoff surface. The first prompt at the Command line chooses whether to export the surface from a file or the screen. The file option will prompt for a triangulation file (.tin or .flt) and then the Topcon TIN file to create. The screen option can be used to export a surface from 3d Faces or TIN lines from the drawing. The screen option has the following prompts:



TopCon TN3 Export (Feb. 22, 2005)

Choose Type of Export
○ Triangle Faces
○ Triangle Edges
● Triangulation File

Source Units
○ Metres ● U.S. Survey Feet ○ Int. Feet

-

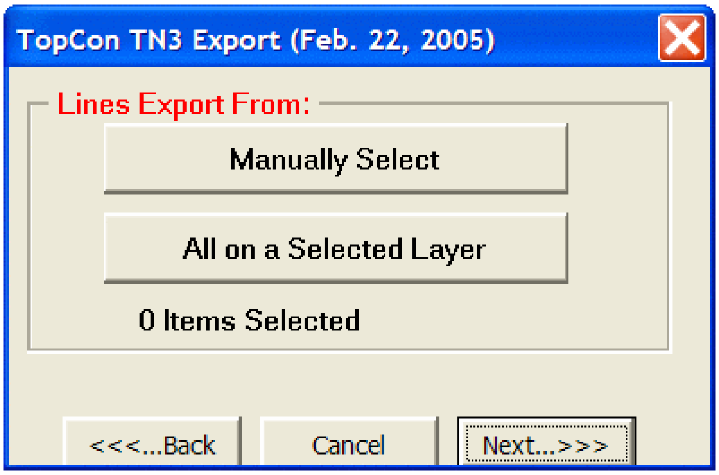
Choose Type of Export

- **Triangle Faces:** Triangulation networks that consist of edge matched 3DFaces defined by three points.
- **Triangle Edges:** Triangulation Networks that consist of edges drawn with Lines defined by two points.
- **Triangulation File:** A Carlson triangulation file (with a DOS extension of .flt).

Source Units: Select the appropriate unit type of the entities to be exported, then press NEXT.

If the Triangulation File option is chosen, a standard windows file selection dialog will open to allow for the selection of the .flt file.

If Triangulation Edges or Faces are used for the export, you must select the entities to be exported from the screen. The following dialog opens:



0 Items Selected

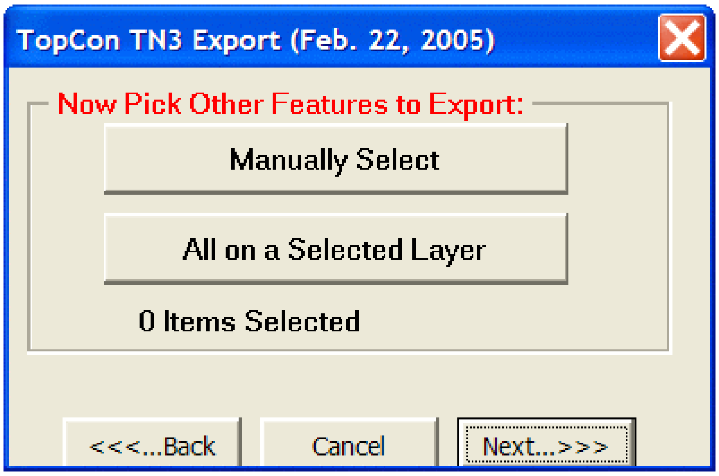
Manually Select allows on-screen selection with any of the various methods (Window, Crossing, Crossing Polygon, etc.)

All on a Selected Layer allows selection of a single entity. The command then selects all Lines or 3DFaces on the layer of the selected entity for export, filtering entities not on selected layer.

Generally, you can select any entities drawn on the screen without special care. The command filters out all types except Lines or 3DFaces depending on the type selected.

When Processing Lines: Crossings, crossing polygon, and fence selection sets can often result in "spikes" around the edges. The command generally discards these spikes, or reconnects them. In any case, better results are developed with clean selections of drawing entities.

Pressing NEXT will open the following dialog:

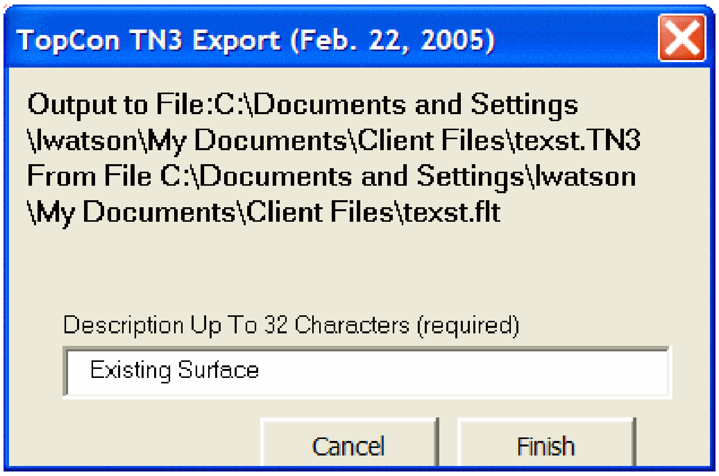

TopCon TN3 Export (Feb. 22, 2005)
Now Pick Other Features to Export:
Manually Select
All on a Selected Layer
0 Items Selected
<<<...Back
Cancel
Next...>>>

Other Features to Export: Often times, landmark lines, or other features will assist in orientation to the user when using the TN3 file in the field. For example: Property lines, project centerlines, or other well established reference lines. These features may be added and displayed on the TN3 by choosing them at this prompting. The Other Features dialog opens with all three Source Formats.

Selections are made as described above.

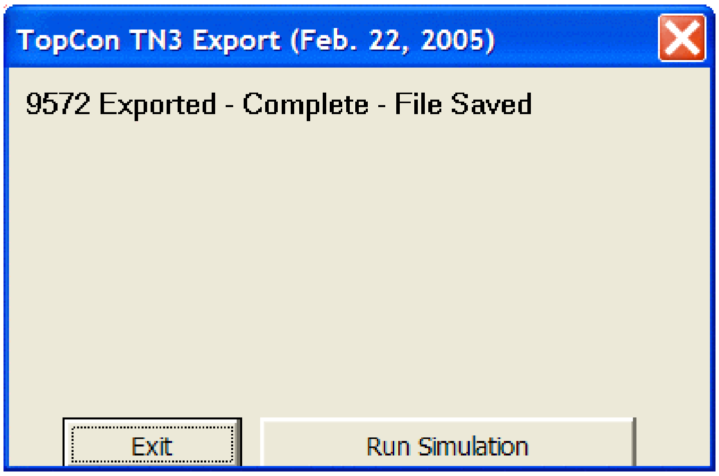
Once the selections are made and the dialog reappears, press NEXT.

Naming the TN3 File: After all the triangulation and feature items are selected from the graphics screen, the command requests a name for the output file. Once a name is given, the following dialog reviews all the selections made. A description for the job can be added at this time. Press Finish when ready to proceed.


TopCon TN3 Export (Feb. 22, 2005)
Output to File:C:\Documents and Settings
\lwatson\My Documents\Client Files\texst.TN3
From File C:\Documents and Settings\lwatson
\My Documents\Client Files\texst.flt

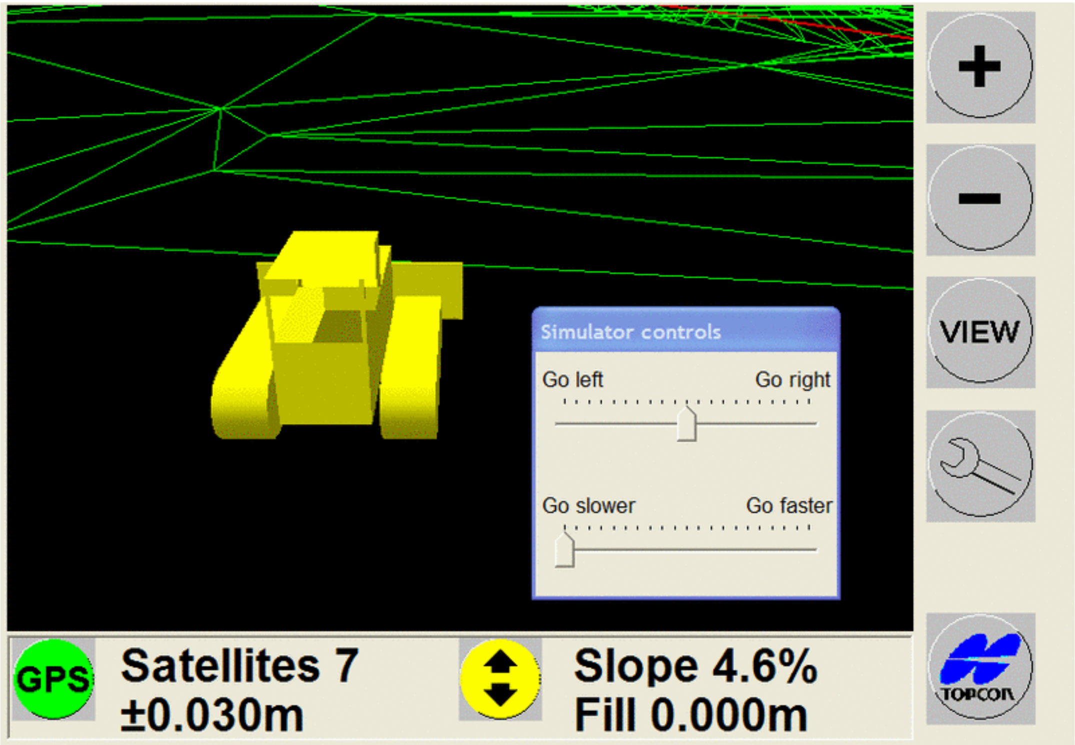
Description Up To 32 Characters (required)
Existing Surface
Cancel
Finish

The program will process the selected entities and/or files and report as shown here:


TopCon TN3 Export (Feb. 22, 2005)
Exit
Run Simulation

9572 Exported - Complete - File Saved

To view the final output, press the Run Simulation button, or press Exit to return to the Carlson program.


Simulator controls
Go left
Go right
Go slower
Go faster
VIEW
GPS
TOPCON

Satellites 7
±0.030m

Slope 4.6%
Fill 0.000m

Run Simulation Dialog

Edit Menu

3

Undo

This command allows you to reverse the effect of previously issued commands.

Prerequisite: None

Keyboard Command: U

Redo

This command allows you to reverse the effects of the previous UNDO command.

Prerequisite: None

Keyboard Command: REDO

Erase Select

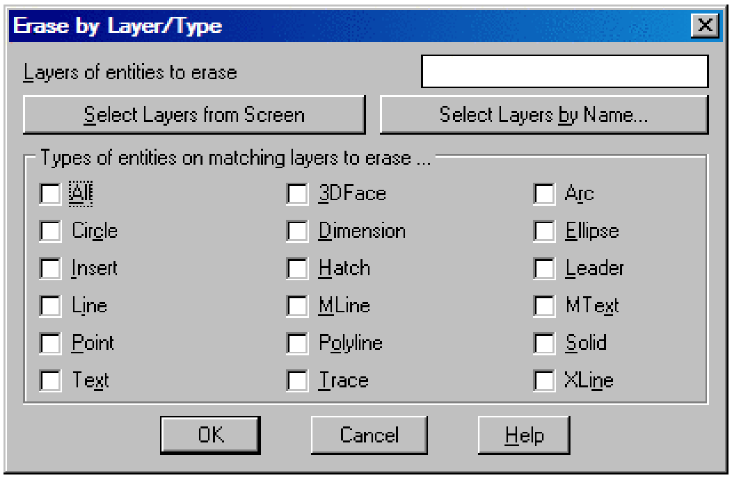
This command allows you to remove objects from a drawing.

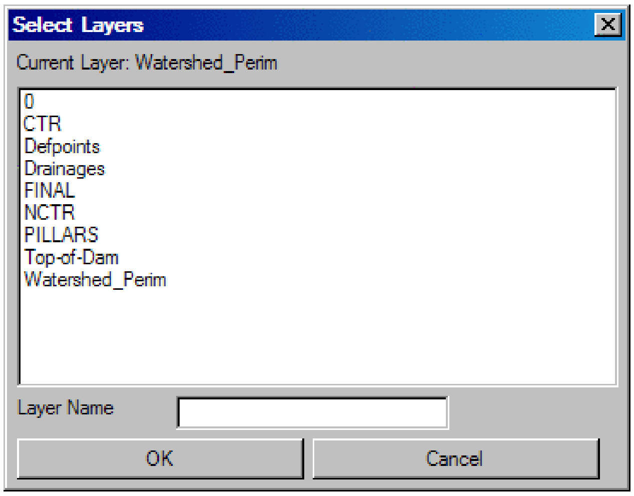
Prerequisite: None

Keyboard Command: ERASE, E

Erase by Layer

This command will ERASE all the entities on the specified layers but will not delete these layers from the drawing. The command prompts for the layer name to erase and then erases all entities on that layer. In addition to typing in the layer name, you can also specify a layer to delete by picking an entity on that layer. To select layers by picking, first click the **Select Layers from Screen** button and then select the entities on the layers to be deleted. The **Select Layers by Name** button allows you to choose a layer name from a list of layers in the drawing. You can also specify which types of entities to erase. For instance, if you have both linework and points on the same layer and you want to erase only the linework, you can click off All and check Line and Polyline. The **Save** and **Load** buttons save and recall the layer names.


Erase by Layer/Type
Layers of entities to erase
Select Layers from Screen
Select Layers by Name...
Types of entities on matching layers to erase ...
☐ All
☐ 3DFace
☐ Arc
☐ Circle
☐ Dimension
☐ Ellipse
☐ Insert
☐ Hatch
☐ Leader
☐ Line
☐ MLine
☐ MText
☐ Point
☐ Polyline
☐ Solid
☐ Text
☐ Trace
☐ XLine
OK
Cancel
Help



Current Layer: Watershed_Perim

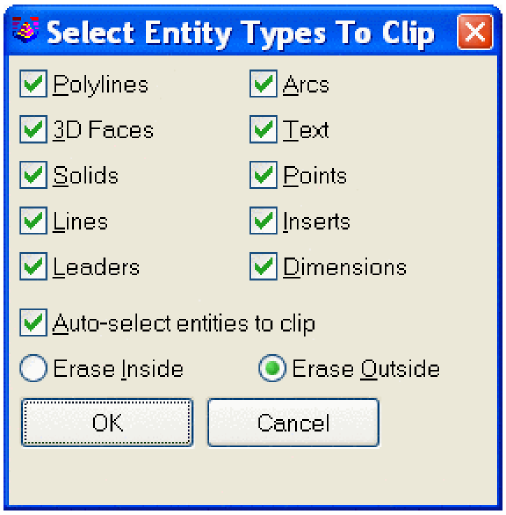
0
CTR
Defpoints
Drainages
FINAL
NCTR
PILLARS
Top-of-Dam
Watershed_Perim

Pulldown Menu Location: Edit > Erase
Keyboard Command: ldel
Prerequisite: Something to erase

Erase by Closed Polyline

This tool is used to clean up drawing geometry at the extents of a polyline boundary. It provides options to erase adjacent geometry as well as trim geometry crossing the fence of the polyline.

First, select the boundary polyline. Only one can be selected. Designate the desired options in the following dialog. The top section of the dialog allows you to toggle which object types should be affected by the operation. Note that some of the objects, such as text and inserts, cannot be trimmed.



☑ Polylines ☑ Arcs
☑ 3D Faces ☑ Text
☑ Solids ☑ Points
☑ Lines ☑ Inserts
☑ Leaders ☑ Dimensions

☑ Auto-select entities to clip

○ Erase Inside ● Erase Outside

In the middle of the dialog is a toggle that determines whether to prompt for objects to process. If you want to isolate the drawings contents to that of the selected polyline, turn this toggle on. Note that all geometry in the drawing is effected, even geometry that is outside of the current viewport. Many users will prefer to turn this toggle off, so that they can be prompted to manipulate the geometry.

The bottom row allows you to choose whether to erase all the entities on the inside or outside of the polyline.

Pulldown Menu Location: Edit > Erase
Keyboard Command: erasepline
Prerequisite: Entities and a closed polyline

Erase Outside

This command erases all the entities outside of a user specified window. This can be useful if you somehow place entities way outside your drawing limits and want to easily erase them.

Prompts

Pick 1st corner of window to erase outside of: *Pick point location*
Pick 2nd corner: *Pick second point location*

Pulldown Menu Location: Edit > Erase
Keyboard Command: eraseout
Prerequisite: Entities to erase

Move

This command allows you to displace objects a specified distance in a specified direction.

Prerequisite: None

Keyboard Command: MOVE, M

Clipboard

This command allows for different cut, copy, and paste options.

Cut

To cut objects to the Clipboard.

- Select the objects you want to cut.
- From the Clipboard command, choose Cut.

The objects are available to be pasted into other Windows applications.

Copy

To copy objects to the Clipboard.

- Select the objects you want to copy.
- From the Clipboard command, choose Copy.

Copy with Base Point

To copy objects to the Clipboard. When the objects are pasted into a drawing, the program places them relative to the specified base point.

- Select the objects you want to copy.
- From the Clipboard command, choose Copy with Base Point.
- Specify the base point.

Paste

The objects currently on the Clipboard are pasted into the drawing at the specified insertion point.

- From Clipboard command, choose Paste.

Paste as Block

The objects currently on the Clipboard are pasted into the drawing as a block at the specified insertion point.

- From Clipboard command, choose Paste as Block.

Paste to Original Coordinates

The objects currently on the Clipboard are pasted into the drawing using the coordinates from the original drawing.

- From Clipboard command, choose Paste to Original Coordinates.

Standard Copy

This command copies all objects you select to the Clipboard. You can paste the contents of the Clipboard into a document or drawing as an OLE object.

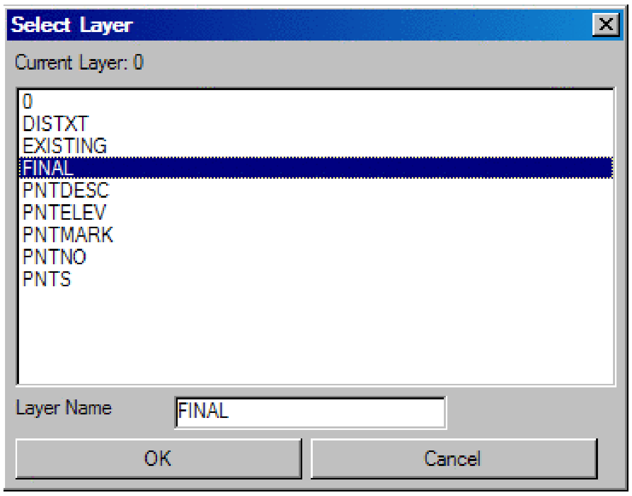
You can also use CTRL+C to run this command. If the cursor is in the drawing area, Carlson TakeOff copies the selected objects to the Clipboard. If the cursor is on the command line or in the text window, the program copies the selected text to the Clipboard.

Prerequisite: None

Keyboard Command: COPY

Copy To Layer

This command is used to copy a selected entity or entities and put the copy in a specified layer. Once copied to the chosen layer the entity or entities will take on the characteristics of that layer (color, linetype, etc.).



Prompts

Select entities to copy.
Select objects: *select entities*
Select Layer dialog *select a layer from list and click OK*

Pulldown Menu Location: Edit > Copy
Keyboard Command: copy2layer
Prerequisite: Entities to be copied

Copy Polyline Section

This command is used to copy a portion of a polyline, at specified points, and put the copied portion onto another layer. The portion of existing polyline that is being copied still remains as part of the original entity (with no break) , while the new portion, with its chosen layer designation, is a new polyline.

Prompts

Select polyline to copy: *Pick a polyline*
Select first break point along polyline: *Pick location on the polyline*
Select second break point along polyline: *Pick the second location on the same polyline*
Layer name <CTR>: wall

Pulldown Menu Location: Edit > Copy
Keyboard Command: copy_pl
Prerequisite: Polyline to be copied

Offset To Layer

This is a command to offset a polyline and put the offset polyline into a separate layer from the original polyline.

Prompts

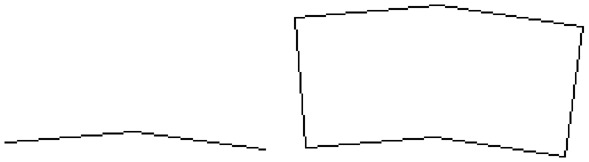
Offset to layer <0>: *ROW*
Enter the offset amount: *20*
Select object to offset: *pick a polyline to offset*

Specify point on side to offset: *pick a point*

Pulldown Menu Location: Edit > Offset
Keyboard Command: offset_layer
Prerequisite: Linework to offset

Offset to Area

This command offsets a polyline by a distance that results in creating the specified target area. The source polyline should represent the frontage on the area. There is an option to connect the sides between the source and offset polylines to make a closed polyline.



Before and after Offset to Area

Prompts

Pick line or polyline to offset: pick a polyline
Select side to offset: pick a point on the offset side
Keep existing polyline [Yes/<No>]? *press Enter*
Create closed polyline [<Yes>/No]? *press Enter*
Acres/<Enter target area (s.f.)>: *90000*

Pulldown Menu Location: Edit > Offset
Keyboard Command: offset_area
Prerequisite: polyline to offset

Multiple Offsets

This command applies the same offset multiple times in series from the original polyline.

Prompts

Specify offset distance <20.0000>: *25*
Enter Number of Repetitions <1>: *3*
Select object to offset or <exit>: *pick a polyline to offset*
Specify point on side to offset: *pick a point*

Pulldown Menu Location: Edit > Offset
Keyboard Command: offset_mult
Prerequisite: Linework to offset

Variable Offset

This is a command to offset a polyline, with different offset amounts for each polyline segment of the same polyline. The offset distances can be variable, and you choose between a Line or a Point method at the command line.

Prompts

Vary offsets by line segments or at points [<Line>/Point]? *press Enter*
Select a polyline to offset (Enter for none): *pick polyline*
Select side to offset: *pick a point on the side to offset to*
As you go from segment to segment, you can enter in different offset values for each line segment.
Enter the segment horizontal offset <0.000>: 56
Enter the segment horizontal offset <56.000>: 33
Enter the segment horizontal offset <33.000>: 12
Select a polyline to offset (Enter for none): *press Enter*

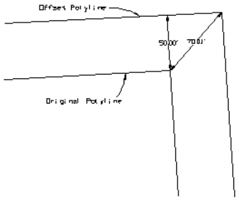
Pulldown Menu Location: Edit > Offset
Keyboard Command: VOFFSET
Prerequisite: A polyline to offset

Buffer Offset

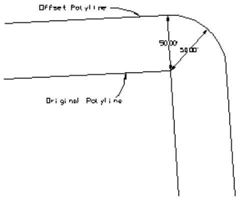
This command offsets a polyline, and maintains a fixed distance from the original polyline by placing an arc on convex corners. The standard *Offset* command can actually have a distance greater than the offset at corners. In the example shown, the distance between the corners of the original and offset polylines is 70.01, while the offset distance is 50.0. *Buffer Offset* makes an offset polyline that doesn't exceed the offset distance. This is useful when you want an offset that goes no further than the offset distance, such as wetland offsets. Later versions of AutoCAD can achieve the same effect using the standard *Offset* command by changing the system variable OFFSETGAPTYPE to 1.

Prompts

Enter the offset amount: *50*
Select object to offset: *pick the original polyline*
Specify point on side to offset: *pick a point on the side to offset to*



Regular Offset



Buffer Offset

Pulldown Menu Location: Edit > Offset
Keyboard Command: boffset
Prerequisite: A polyline to offset

Standard Explode

This command allows you to break a compound object into its component objects.

Results differ depending on the type of compound object you're exploding. The following is a list of objects that can be exploded and the results for each.

- **All Explodable Objects**: Produces object geometry that may look the same, but the color, linetype, and lineweight of the object may change.

- **Block**: Removes one grouping level at a time. If a block contains a polyline or a nested block, exploding the block exposes the polyline or nested block object, which must then be exploded to expose its individual objects.

Blocks with equal X, Y, and Z scales explode into their component objects. Blocks with unequal X, Y, and Z scales (nonuniformly scaled blocks) might explode into unexpected objects.

When nonuniformly scaled blocks contain objects that cannot be exploded, they are collected into an anonymous block (named with a "∗E" prefix) and referenced with the nonuniform scaling. If all the objects in such a block cannot be exploded, the selected block reference will not be exploded. Body, 3D Solid, and Region entities in a nonuniformly scaled block cannot be exploded.

Exploding a block that contains attributes deletes the attribute values and redisplays the attribute definitions.

- **2D and Lightweight Polyline**: Discards any associated width or tangent information.

- **Wide Polyline**: Places the resulting lines and arcs along the center of the polyline. TakeOff discards any associated width or tangent information.

- **3D Polyline**: Explodes into line segments. Any linetype assigned to the 3D polyline is applied to each resulting line segment.

- **Text Explode to Polylines**: Explodes polylines depending on the font used for various annotations, this can make the resulting polylines more efficient in terms of vertex count.

- **Leaders**: Explodes into lines, splines, solids (arrow heads), block inserts (arrow heads, annotation blocks), Mtext, or tolerance objects, depending on the leader.

- **Mtext**: Explodes into text entities

- **Multiline**: Explodes into lines and arcs.

- **3D Solid**: Explodes planar surfaces into regions. Nonplanar surfaces explode into bodies.

- **Region**: Explodes into lines, arcs, or splines.

- **Body**: Explodes into a single-surface body (nonplanar surfaces), regions, or curves.

- **Polyface Mesh**: Explodes one-vertex meshes into a point object. Two-vertex meshes explode into a line. Three-vertex meshes explode into 3D faces.

- **Circle Within a Nonuniformly Scaled Block**: Explodes a circle within a nonuniformly scaled block into ellipses.

- **Arc Within a Nonuniformly Scaled Block**: Explodes an arc within a nonuniformly scaled block into elliptical arcs.

Prerequisite: None

Keyboard Command: EXPLODE, X

Block Explode

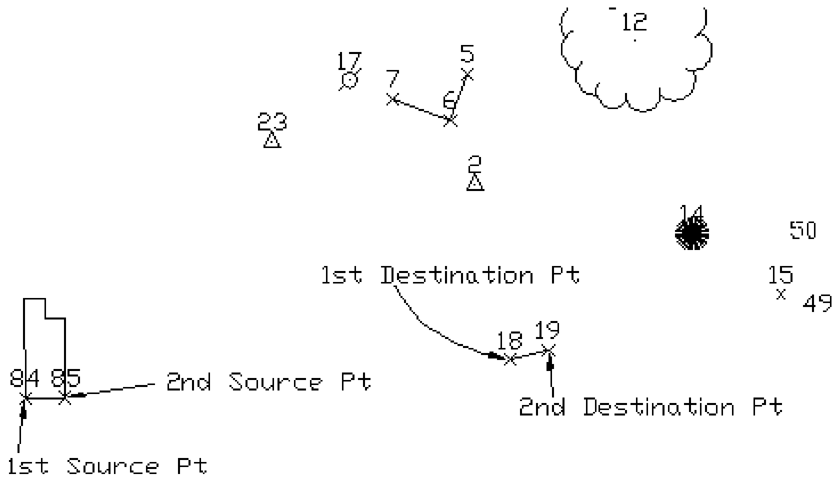
This command retains the values of attributes when a block is exploded. The standard *Explode* command changes the attribute values back to the attribute type. For example, using *Explode*, a Carlson point block would become PNTNO, PNTELEV, PNTDESC. *Block Explode* would keep the point attribute values, such as 10, 1000.0, EP. The layer names of the exploded block attributes can be either the insert layer of the parent block or the original attribute layers from the block definition.

Pulldown Menu Location: Edit
Keyboard Command: explode2

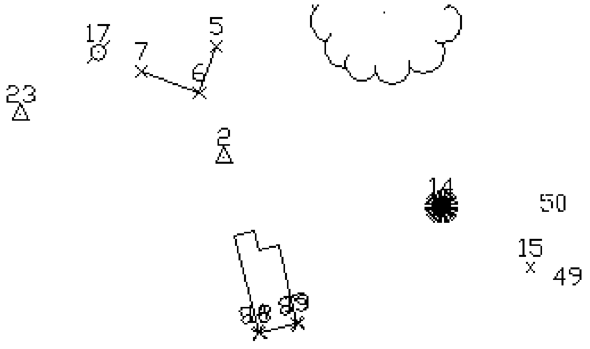
Prerequisite: A block to be exploded

2D Align

This command will align (translate, rotate and scale) the selected objects using two pairs of source and destination control points. The difference between the first source point and first destination point determines the translation amount. The difference between the angle and distance from the first and second source points compared to the angle and distance from the first and second destination points determines the rotation and scale. The scale part of the alignment is optional. This 2D Align function is the same as the standard Align function except that this 2D Align function does not use elevations so that the alignment is always in 2D. The control points can be screen picked or entered by point numbers.



Before and after 2D Align



Prompts

Select entities to align.
Select objects: *pick entities to process*
First Source Point?
Pick point or point number: *pick point 84*
First Destination Point?
Pick point or point number: *pick point 18*
Second Source Point?
Pick point or point number: *pick point 85*

Second Destination Point?
Pick point or point number: *pick point 19*
Scale factor: 1.00434258
Scale objects based on alignment points [Yes/<No>]? *Y*
This command DOES NOT change the coordinates in the CooRDinate file!
Use Coordinate File Utilities menu, Update CRD File from Drawing.

Pulldown Menu Location: Edit > Align
Keyboard Command: scalign
Prerequisite: None

Standard Align

Aligns objects with other objects in 2D and 3D

You use ALIGN to move, rotate, or scale objects into alignment with other objects. Add source points to the objects you want to align, and add destination points to the objects to which you want the source objects to align. You can add up to three pairs of source and destination points to align an object.

The first set of source and destination points defines the base point for the alignment. The second set of points defines the angle of rotation.

When you select three point pairs, you can move and rotate the selected objects in 3D to align with other objects.

If you use two source and destination points to perform a 3D alignment on nonperpendicular working planes, you get unpredictable results.

After you enter the points, Takeoff prompts you to scale the object. The program uses the distance between the first and second destination points as the reference length to which the object is scaled. Scaling is available only when you are aligning objects using two point pairs.

Prompts

1 Specify first source point: **pick point**

2 Specify first desitination point: **pick point**

3 Specify second source point: **pick point**

4 Specify second desitination point: **pick point**

5 Specify third source point or <continue>: **Press Enter**

6 Scale objects based on alignment points? [Yes/No] <N>: **Press Enter**

Prerequisite: None

Keyboard Command: ALIGN

Trim

This command allows you to trim objects at a cutting edge defined by other objects.

Prompts

1 Select cutting edges ...

Select objects: **pick entity**

2 Select object to trim or shift-select to extend or [Project/Edge/Undo]: **select entity to be trimmed**

- **Project**: You can project the object to be trimmed in order to trim objects that do not intersect.
- **Edge**: You can project the trimming edge in order to trim objects that do not intersect.
- **Undo**: This option allows you to undo the above projections.

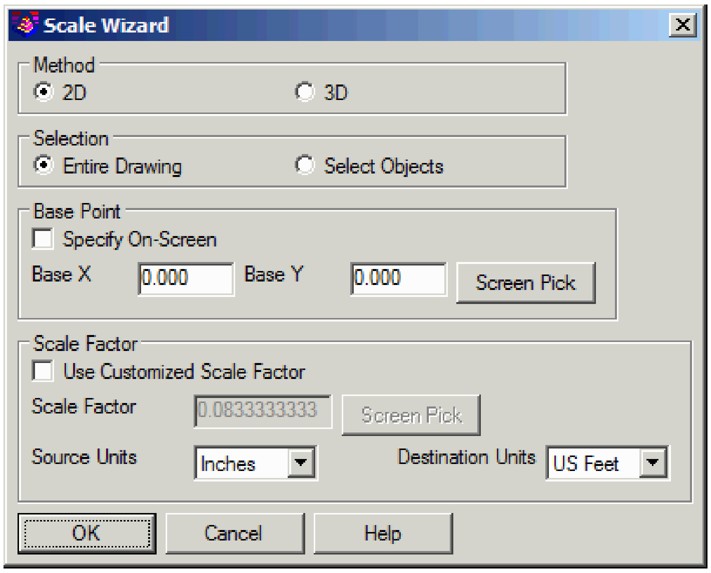
Prerequisite: None

Keyboard Command: TRIM, TR

2D Scale

This command will scale selected entities using a specified scale factor and base point. This 2D Scale method differs from the 3D Scale method in that it only scales the entities in the x,y coordinates and does not change the elevations of the entities. A case for using 2D Scale is when the x,y coordinates are in architectural units of inches and the elevation is in feet and you want to convert the x,y coordinates to feet. When the entities are at zero elevation, then 2D Scale makes no difference and it is better to use 3D Scale because it is faster.

In the dialog shown here, you have the ability to determine what is scaled: the entire drawing or a selection set. If you choose Select Objects, you will be prompted to select the entities to scale after clicking the OK button. function hideInfo() info = document.getElementById('infoline'); info.innerHTML = ' '; info.style.visibility = 'hidden'; function showInfo(title) info = document.getElementById('infoline'); info.innerHTML = title; info.style.visibility='visible'; The Base Point acts as the center of the scaling operation and remains stationary. The base point you specify identifies the point that remains in the same location as the selected objects change size.


Scale Wizard

Method
● 2D ○ 3D

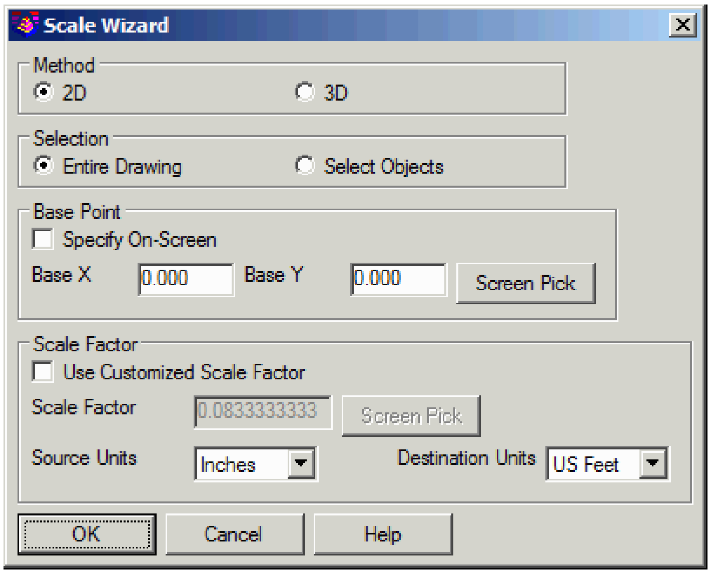
Selection
● Entire Drawing ○ Select Objects

Base Point
☐ Specify On-Screen
Base X 0.000 Base Y 0.000 Screen Pick

Scale Factor
☐ Use Customized Scale Factor
Scale Factor 0.0833333333 Screen Pick
Source Units Inches Destination Units US Feet

OK Cancel Help

There are two methods for scaling entities: by Units Conversion or by a Customized Scale Factor. The dialog above shows one application of this routine, converting a drawing from architectural (Inches) to decimal units (US Feet) when the architectural units have the drawing x,y coordinates in inches and the elevations in feet. In this case, 2D Scale can be used to apply a 1/12 scale factor (0.08333333) to convert the inches to feet for the x,y coordinates and leave the elevations unchanged.



Scale Wizard

Method: ● 2D ○ 3D

Selection: ● Entire Drawing ○ Select Objects

Base Point: ☐ Specify On-Screen

Base X: 0.000 Base Y: 0.000

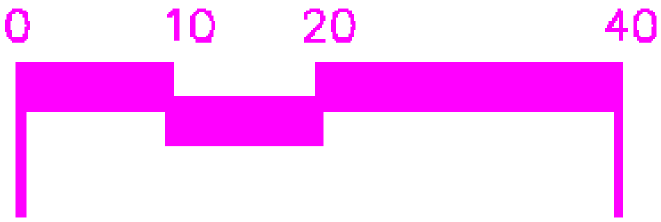
Scale Factor: ☐ Use Customized Scale Factor

Scale Factor: 0.0833333333

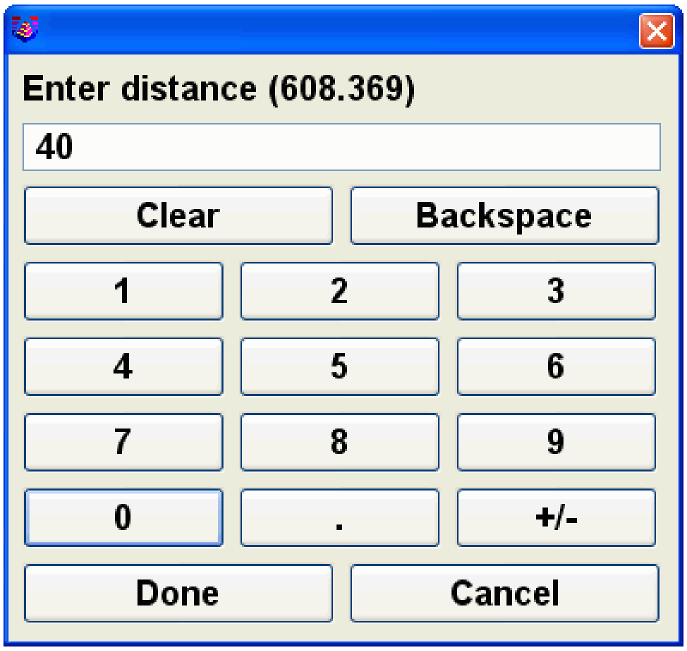
Source Units: Inches

Destination Units: US Feet

If the scale you want to apply is not a standard conversion, a manual scale can be entered by checking on the Use Customized Scale Factor checkbox. A scale factor greater than 1 enlarges the object. A scale factor between 0 and 1 shrinks the object.



To scale a drawing by a known distance on the plan (which is often the case when working with PDF imports) select the Screen Pick button. This will prompt you to pick the beginning and ending points along a known distance (Like the bar scale above). The program will then report the current distance of the segment (in this example 608.369) and allow you to enter in the desired distance (which is 40 in this case).



Enter distance (608.369)

40

The program will then calculate the proper Scale Factor to apply to the selection set. In this example, .0657769021 on the Entire Drawing.

Pulldown Menu Location: Edit > Scale
Keyboard Command: scscale
Prerequisite: None

Standard Scale

This command allows you to enlarge or reduce selected objects equally in the X, Y, and Z directions.

Prompts

1 Select objects: **pick entities**

2 Specify base point: pick point on screen as reference

3 Specify scale factor or [Reference]: **scale to desired size**

Prerequisite: None

Keyboard Command: SC

Extend To Edge

This command allows you to extend an object to meet another object.

Prompts

1 Select boundary edges ...

Select objects: **pick entity**

2 Select object to extend or shift-select to trim or [Project/Edge/Undo]: **pick entity**

You have the option of trimming or projecting objects and edges.

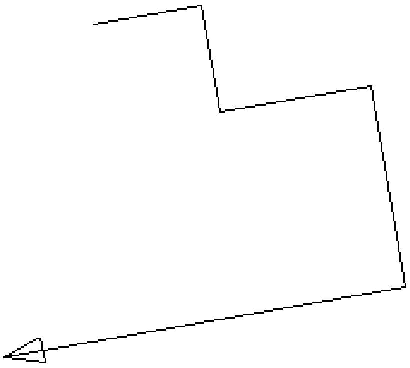
Prerequisite: None

Keyboard Command: EXTEND

Extend by Distance

This command extends a line or polyline, or creates new lines or polylines off of an existing one. By specifying a distance, a new segment of the line or polyline can be drawn from the current position. The current position and direction along the line or polyline is indicated by an arrowhead. Extend by Distance starts by selecting an existing line or polyline. Initially, the current position will be the closest vertex to where the line or polyline was selected. Extending from the endpoint of a polyline will add a new point to that polyline, while extending from any other point will create a new polyline.

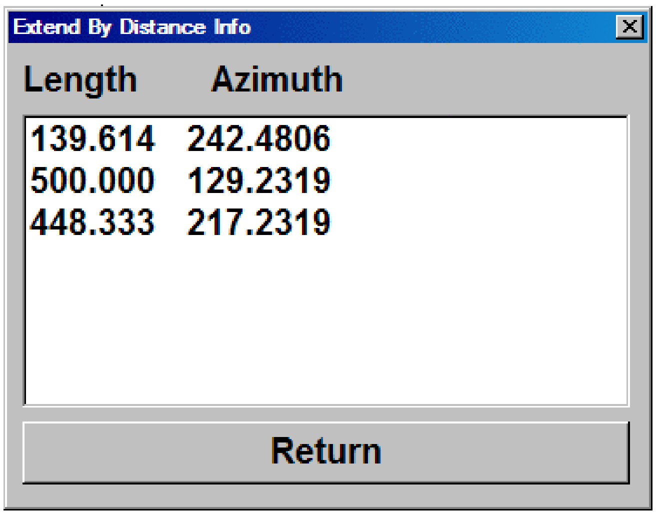
There are two modes of operation: draw mode (D) and move mode (M). When in draw mode, extending will draw line or polyline segments. In move mode, the current position arrowhead can be moved without drawing segments. The orientation of the current position arrowhead can be changed with the Right, Left, and Angle commands.



The second prompt for this command offers numerous options in the form of key letters. These key letters are listed below along with their full names and actions. The list of the Extend by Distance commands are:

# - Number: Distance to draw or extend
A# - Angle change: Rotates pointer by specified number of degrees
A - Align: Rotates pointer to align with segment
B - Bearing: Sets pointer direction by bearing in format: Qdd.mmss with Q- quadrant, d-degrees, m-minutes, s-seconds (e.g. 130.1005 is NE 30 degrees, 10 minutes, and 5 seconds)
C - Close: Closes the polyline
D - Draw Mode: Actions draw or extend the line or polyline
E - Extend to Edge: Extends to intersection with a selected line or polyline
I - Input mode: Toggles distance input between decimal feet and feet-inches
L - Left rotate: Rotates counterclockwise 90 degrees
M - Move Mode: Actions only move the pointer
N - Next: Moves pointer forward to next point
O - Open: Opens the polyline
P - Previous: Moves pointer backward to previous point
R - Right rotate: Rotates clockwise 90 degrees
S - Switch: Reverses pointer direction
T# - Total distance: Sets current segment to specified distance
U - Undo: Undo the last Extend by Distance command
Z - Zoom mode: Toggles auto-zoom between on/off
? - Info: Displays lengths of current polyline

H - Help: The Help option also displays this Extend by Distance Commands list.
Press <Enter>: Ends the routine

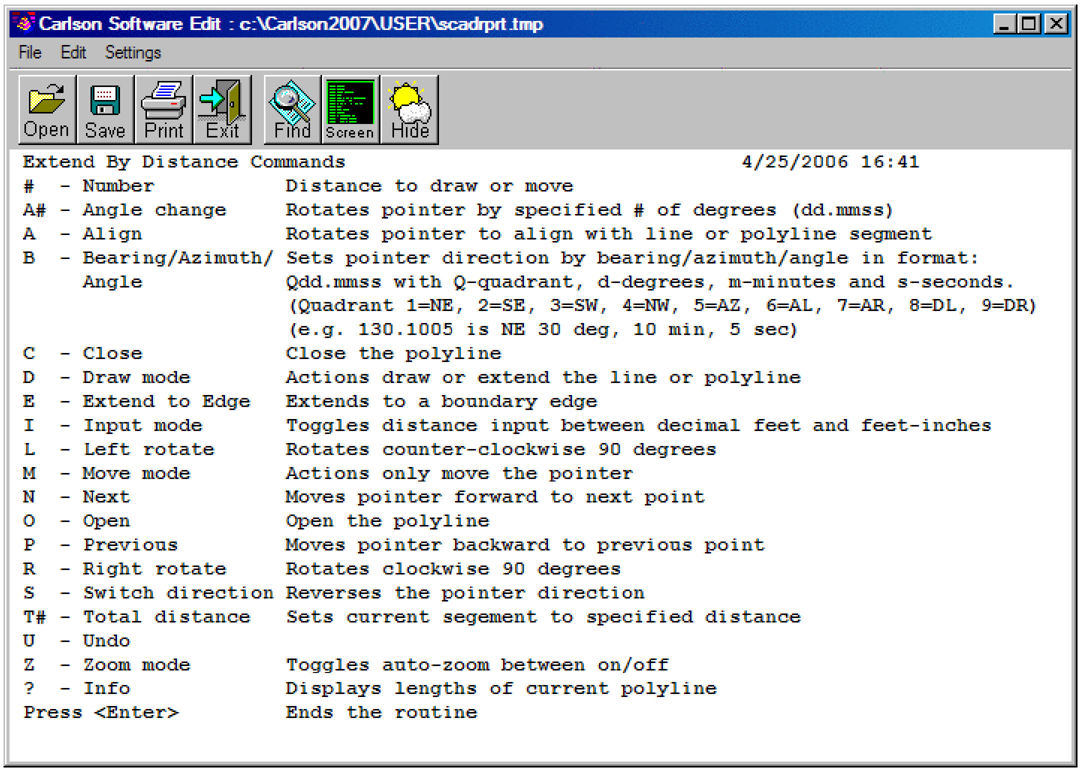


Length	Azimuth
139.614	242.4806
500.000	129.2319
448.333	217.2319

The result of using the Info (?) feature

Prompts

Select line or polyline to extend: *select line or polyline near the place to extend*
Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): *50* The line is extended by 50 units. Use the Pick option to pick a distance.
Pick/Horizontal Distance to Extend ([Enter] for new line): *R* Rotate right 90 degrees.
Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): *50* The line is extended by 50 units. Use the Pick option to pick a distance.
Enter or pick distance to draw (A,B,C,E,I,L,M,N,O,P,R,S,T,U,Z,?,Help): *press Enter*
Extend another (<Yes>/No)? *No*
Note: R50 and L10 can be used to go right 50, left 10, etc.



```
Extend By Distance Commands                           4/25/2006 16:41
#  - Number             Distance to draw or move
A# - Angle change       Rotates pointer by specified # of degrees (dd.mmss)
A  - Align              Rotates pointer to align with line or polyline segment
B  - Bearing/Azimuth/   Sets pointer direction by bearing/azimuth/angle in format:
     Angle              Qdd.mmss with Q-quadrant, d-degrees, m-minutes and s-seconds.
                        (Quadrant 1=NE, 2=SE, 3=SW, 4=NW, 5=AZ, 6=AL, 7=AR, 8=DL, 9=DR)
                        (e.g. 130.1005 is NE 30 deg, 10 min, 5 sec)
C  - Close              Close the polyline
D  - Draw mode          Actions draw or extend the line or polyline
E  - Extend to Edge     Extends to a boundary edge
I  - Input mode         Toggles distance input between decimal feet and feet-inches
L  - Left rotate        Rotates counter-clockwise 90 degrees
M  - Move mode          Actions only move the pointer
N  - Next               Moves pointer forward to next point
O  - Open               Open the polyline
P  - Previous           Moves pointer backward to previous point
R  - Right rotate       Rotates clockwise 90 degrees
S  - Switch direction   Reverses the pointer direction
T# - Total distance     Sets current segement to specified distance
U  - Undo
Z  - Zoom mode          Toggles auto-zoom between on/off
?  - Info               Displays lengths of current polyline
Press <Enter>           Ends the routine
```

The result of using the Help (H) option

Pulldown Menu Location: Edit > Extend
Keyboard Command: extender
Prerequisite: An existing line or polyline with at least one segment from which to start.

Extend Arc

This command extends an arc entity.

Prompts

Pick arc to extend: *select an arc entity*
Break Arc at Extension [Yes/<No>]? *N* Answering *Yes* will create a new arc starting at the end of the existing arc.
Enter or pick the distance to extend: *5* This extends the arc 5 units
Enter or pick the distance to extend ('U' to Undo): *press Enter to end*

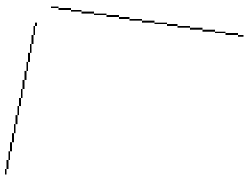
Pulldown Menu Location: Edit > Extend
Keyboard Command: extarc
Prerequisite: An arc

Extend to Intersection

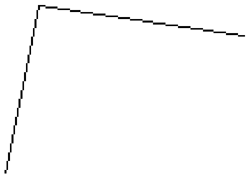
This command extends the end points of two lines and/or polylines, at the same time, to their intersection point.

Prompts

Select first line or polyline to extend: *pick a line or polyline*
Select second line or polyline to extend: *pick another line or polyline*



Before Extend to Intersection



After Extend to Intersection

Pulldown Menu Location: Edit > Extend
Keyboard Command: extint
Prerequisite: Two lines or polylines

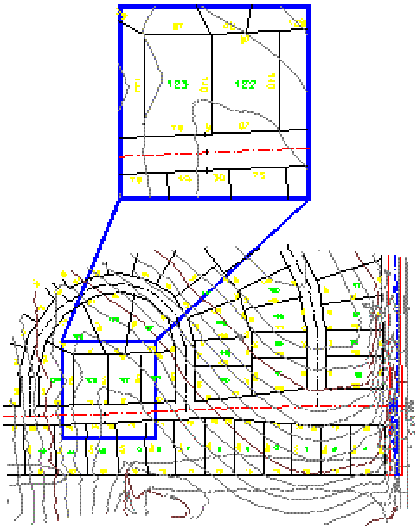
Break by Crossing Polyline

This tool is used to break drawing geometry at the edge of a polyline boundary. It provides options to change the layers of the interior and exterior geometry after it is broken.

First, select the boundary polyline. Only one can be selected. Then select the polylines and lines to be clipped. You will be prompted for options on specifying the layers for the newly broken geometry. Respond with a "Y" if you want to specify a new layer, then enter the new layer name. If the layer name does not exist, it will be created.

Prompts

Select the clip edge polyline: *pick a closed polyline*
Select the polylines and lines to be clipped.
Select Objects: *pick the entities to break*
Specify layer names for Inside segments (Yes/<No>)? *Yes*
Enter a layer name for the Inside segments <0>: *press Enter*
Specify layer names for Outside segments (Yes/<No>)? *Yes*
Enter a layer name for the Outside segments <0>: *Final*



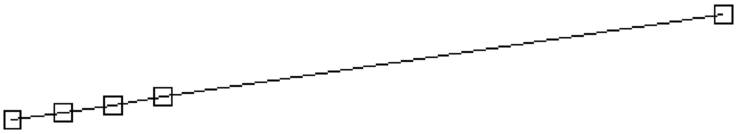
Pulldown Menu Location: Edit > Break
Keyboard Command: clipline
Prerequisite: A closed polyline

Break Polyline at Specified Distances

This command allows you to pick a polyline and break it at a specified distances along the polyline. Following the prompts below, the beginning of the polyline in the illustration was broken into three 55-foot segments.

Prompts

Select polyline to break: *select polyline*
Total Distance: 779.429 This is the length of the polyline reported.
Distance Along Polyline For Break: *55.0*
Distance Along Polyline For Break (Enter to end): *110*
Distance Along Polyline For Break (Enter to end): *165*
Distance Along Polyline For Break (Enter to end): *press Enter*
3 polyline breaks created.



Pulldown Menu Location: Edit > Break
Keyboard Command: breakpl
Prerequisite: A polyline

Break, Select Object, 2nd Point

>

This command allows you to break an object by selecting theobject, then the second break point. The first break point is the point whereyou select the object.

Prompts

1 Select object: **selectentity to break**

2 Specify second break point or[First point]: **select second break point**

Break, Select Object, Two Points

This command allows you to break an object by selecting theobject, then two points. First select the object, then the program will promptyou to select two points that define where the object will be broken.

Prompts

1 Select object: **selectentity to break**

2 Specify second break point or[First point]: **First**

3 Specify first break point: **pick first point**

4 Specify second break point: **pick second point**

Break at Intersection

This command will break a line, arc or polyline at the intersection of another line, arc or polyline. In many cases this command is used in conjunction with the *Area by Lines & Arcs* command. In order to get the correct area of a figure, it is often necessary to break it from adjoining lines.

Prompts

Select Line, Arc, or Polyline to Break
Select object: *select object to break*
[int on] Pick Intersection to break at: *pick intersection point*

Pulldown Menu Location: Edit > Break
Keyboard Command: breakat

Break at Selected Point

This command allows you to break an object by selecting the object. Only one pick is necessary since TakeOff both selects the object and treats the selection point as the break point.

Prompts

1 Select object: select entity to break

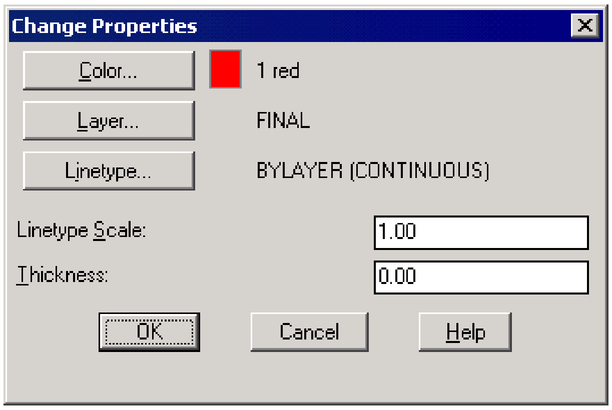
Select an object to break

Prerequisite: None

Keyboard Command: BREAK

Change Properties

This command allows you to change certain properties of existing objects.



Color... 🟥 1 red

Layer... FINAL

Linetype... BYLAYER (CONTINUOUS)

Linetype Scale: 1.00

Thickness: 0.00

1 In the Change Properties dialog box, you must choose the properties to modify.

- **Color**: This option allows you to change the color of the object.
- **Layer**: This option allows you to change the layer of the object.
- **Linetype**: This option allows you to change the linetype of the object.
- **Linetype Scale**: This option specifies the linetype scale factor for the new linetype.
- **Thickness**: This option specifies the distance to extrude the object above or below its elevation.

Note: The Properties command allows you to modify entity specific properties such as the radius of a circle or the height of a text entity.

Prerequisite: None

Keyboard Command: DDCHPROP

Change Elevations

This command will change the elevation of selected entities. It can move the entity to a specified elevation from its current elevation (absolute) or do a differential change by adding or subtracting a value from its current elevation. If Carlson points are selected, their attribute text and z axis coordinate are changed.

Prompts

Ignore zero elevations (<Yes>/No)? *press Enter* If you answer *No*, then entities with elevation 0 will be changed.
[A]bsolute or [D]ifferential Change <A>: *A*
Elevation to change to: *125* By using the Absolute option all entities selected are changed to the elevation 125.
Select Entities for elevation change.
Select objects: *C*
First corner: *pick a point*
Other corner: *pick a point*

Select objects: *press Enter*

If Carlson points are selected, the command warns:
This command DOES NOT change the elevations in the Coordinate file!
Use Coordinate File Utilities menu option F to update the file.

Pulldown Menu Location: Edit > Change
Keyboard Command: chgelev
Prerequisite: Something to change

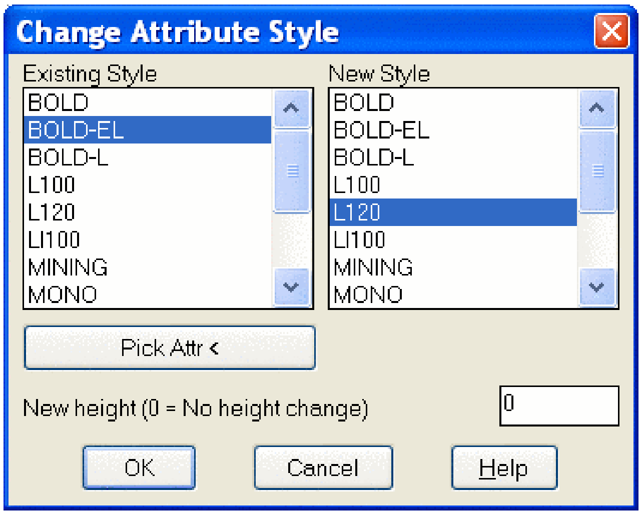
Change Attribute Style

This command will globally change the text style of attributes on the drawing. This can be very useful if all the label styles (such as the point symbol attribute labels) on a drawing must be changed to accommodate a different plotting specification. The default STYLE used for the point symbol attributes is PTXT.

Under **Existing Style**, select the style that is currently applied to the attributes you want to change. If you are unsure of the existing text style, select the **Pick Attr** button, then pick an existing attribute on the screen. When the dialog returns, the text style applied to that attribute will be selected in the list.

Select the **New Style** that you want to apply to the attributes.

Enter a **New Height** for the attributes. An entry of zero (0) will not modify the existing height.



New height (0 = No height change) 0

Pulldown Menu Location: Edit > Change
Keyboard Command: chgattr
Prerequisite: You may want to use the *LIST* command to check the current Text size.

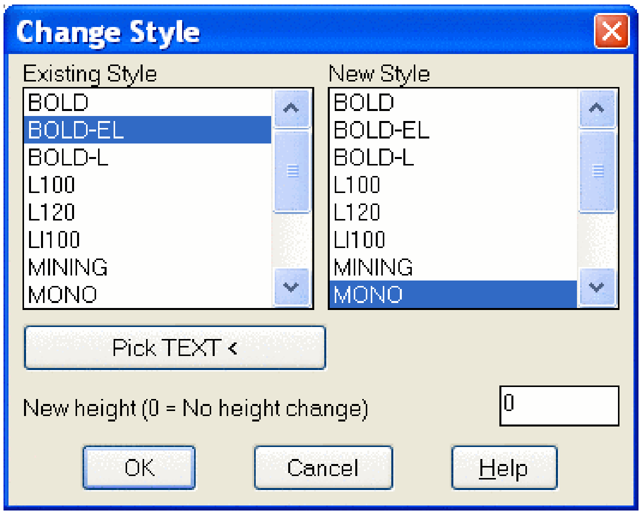
Change Style

This command will globally change the style and height of text on the drawing. This can be very useful if all the text sizes on a drawing must be changed to accommodate a different plotting scale.

Under **Existing Style**, select the style that is currently applied to the text you want to change. If you are unsure of the existing text style, select the **Pick TEXT** button, then pick an existing text entity on the screen. When the dialog returns, the text style applied to that text entity will be selected in the list.

Select the **New Style** that you want to apply to the text.

Enter a **New Height** for the text. An entry of zero (0) will not modify the existing height.

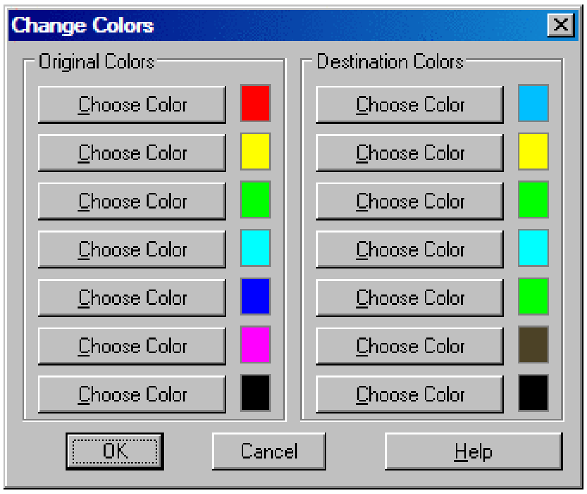

Change Style
Existing Style
BOLD
BOLD-EL
BOLD-L
L100
L120
LI100
MINING
MONO
New Style
BOLD
BOLD-EL
BOLD-L
L100
L120
LI100
MINING
MONO
Pick TEXT <
OK
Cancel
Help

New height (0 = No height change) 0

Pulldown Menu Location: Edit > Change
Keyboard Command: chgstyl
Prerequisite: Text entities

Change Colors

This command is designed to change the original color of existing entities in the drawing to a different color. This is done using the Change Colors dialog. You must match up the original colors of original entities to the preferred colors that they will change to. These "destination colors" are directly to the right of the original colors in the dialog (on the same row). You then click OK and select the specific entities on-screen that you want changed. This routine changes all entities in the drawing that you have chosen and that have an original color that has been changed. Do your dialog box color selections and matching up first, followed by *OK*. Then select the entities.


Change Colors
Original Colors
Destination Colors
Choose Color
OK
Cancel
Help

Prompts

Change Colors dialog Create your color change schemes and click OK.
Select entities to change colors.
Select objects: *select entities*

Pulldown Menu Location: Edit > Change
Keyboard Command: chgcolor
Prerequisite: Entities whose colors are to be changed

Change Block/Inserts Resize

This command resizes blocks inserts while maintaining their insertion position. When prompted to select objects, choose the inserts to resize. Note that this routine does not rescale attributes that may be associated with the selected inserts.

Prompts

Scaling Multiplier <0.5>: Enter the size scale factor.
Select symbols and blocks to scale.
Select objects: *select entities*

Pulldown Menu Location: Edit > Change > Block/Inserts
Keyboard Command: sizeblk
Prerequisite: block/inserts in drawing

Change Block/Inserts Rotate

This is a command to set the angle of blocks by various methods. This command optionally can change the rotation of a block by twist screen angle, azimuth, entity segment or by follow polyline. It will work with Carlson point symbol blocks, or any block. For example, you may receive a drawing from another firm, insert it in, and then want to change the rotation.

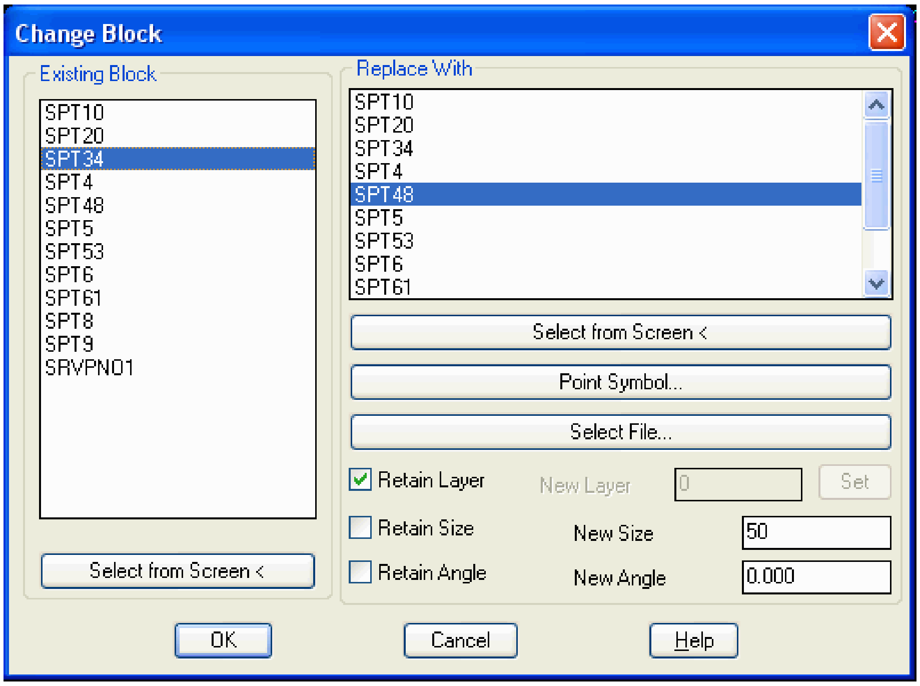
Prompts

Twist by [<Twist screen>/Azimuth/Entity segment/Follow polyline]? *press Enter*
Enter angle relative to current twist screen <0.0>: 30
Select Symbols to Rotate. *pick symbol*
Select objects: 1 found

Pulldown Menu Location: Edit > Change > Block/Inserts
Keyboard Command: TWISTSYM
Prerequisite: None

Change Block/Inserts Substitute

This command is used to replace selected block(s) with a different block. The command optionally can change the size and rotation angle. This command will work with Carlson point symbol blocks, or any block. For example, you may receive a drawing from another firm and want to replace certain inserts with inserts of your own specification. In the dialog shown, we are replacing the block named NASTAR with a block named COHNORTH, which will be inserted at 50 scale and zero rotation.



Existing Block: SPT10, SPT20, SPT34, SPT4, SPT48, SPT5, SPT53, SPT6, SPT61, SPT8, SPT9, SRVPN01 (SPT34 selected)

Replace With: SPT10, SPT20, SPT34, SPT4, SPT48, SPT5, SPT53, SPT6, SPT61 (SPT48 selected)

☑ Retain Layer New Layer 0

☐ Retain Size New Size 50

☐ Retain Angle New Angle 0.000

Existing Block: Select the block name to be replaced. If the block name is unknown, choose the Select from Screen button, then select the block from the current drawing.
Replace With: Select the block that will replace the existing block. You may choose from the list of defined blocks, select an existing block from the current drawing, choose a point symbol from the standard Carlson point library, or select a drawing file.
Retain Size and Rotation: When checked, the new block will retain the size and rotation values from the old block.
New Size: Available if Retain Size and Rotation is not checked. Enter the size for the new block.
New Rotation Angle: Available if Retain Size and Rotation is not checked. Enter the rotation angle for the new block.

Pulldown Menu Location: Edit > Change > Block/Inserts
Keyboard Command: chgblk
Prerequisite: None

Rotate by Bearing

This command allows you to move objects about a base point by a given bearing.

Prompts

1 Select entities to rotate.

Select objects: **pick entities**

2 Base pivot point?

Pick point or point number: **pick a point**

3 Reference Bearing point?

Pick point or point number: **pick a point**

4 Azimuth/<New Bearing (Qdd.mmss)>: **enter a bearing**

Prerequisite: None

Keyboard Command: BROT

Standard Rotate

This command allows you to move objects about a base point using a point as a rotation reference.

Prompts

1 Select objects: **pick entities**

2 Specify base point: pick point on screen as reference

3 Specify rotation angle or [Reference]: **rotate to desired location**

Prerequisite: None

Keyboard Command: ROTATE

Edit Text

This command allows you to edit text and attribute labels.

1 Select Text to Edit: **select the text**

You can modify text in provided text field.

Prerequisite: Text

Keyboard Command: EDITXT

Find and Replace Text

With this command, you can find, replace, select, or zoom to text contained in the current drawing.

Keyboard Command: find
Prerequisite: Text

Text Enlarge/Reduce

This command will scale text entities up or down in size. The routine prompts for a scale multiplier and a selection set of text objects. If you want to enlarge the text enter a value greater than one. If you want to reduce text enter a decimal fraction such as .5. This would reduce the text size by 50%. This command is very useful if you have set up your drawing for one plotting scale and decide to change to a new plotting scale. The Change Text Size command can alternatively be used to set the text size to a specific value.

Pulldown Menu Location: Edit > Text
Prerequisite: Text entities to be changed
Keyboard Command: txtenl

Rotate Text

This command sets the rotation of the selected text to the current twist screen, an entered azimuth, or to align with a line or polyline. The text keeps the same insertion point and justification. The *Twist Screen* option sets the text rotation to align horizontal with the current twist screen. With the *Azimuth* option you can enter the angle or pick two points to define the text rotation. The *Entity segment* aligns the text with a selected line or polyline segment. The *Follow* option aligns the text with the closest polyline segment.

Prompts

Rotate by (<Twist Screen>/Azimuth/Entity segment/Follow/Pick)? *press Enter*
Enter angle relative to current twist screen <0.0>: *23*
Select Text to rotate.
Select objects: *select the text*

Pulldown Menu Location: Edit > Text
Keyboard Command: twisttxt
Prerequisite: Text

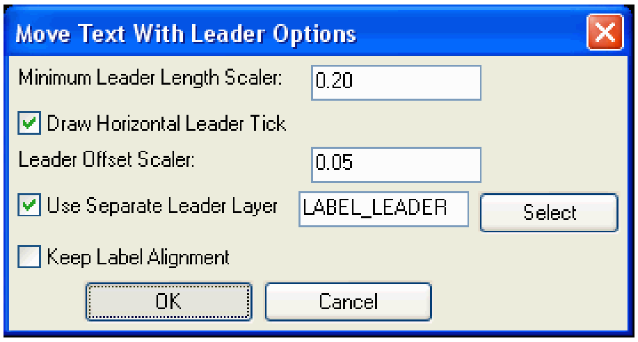
Move Text with Leader

This command moves an existing text entity and creates a leader from a picked point to the new text location. The routine keeps track of the original text location and has an option to restore the text to the original without the leader. To use the Restore function, type R at the Command prompt. Also, to access the options for this command, type O for Options at the Command prompt.

Prompts

Select Label to Move (O for Options,R for Restore): pick any text entity
Pick start point for leader: pick the point where to draw the leader arrowhead
Pick end point for move: pick the end of the leader where to move the text
Select Label to Move (O for Options,R for Restore): O

When Options is chosen the "Move Text With Leader Options" dialog allows the user to customizer the leader and label drawing settings:


Move Text With Leader Options
Minimum Leader Length Scaler: 0.20
☑ Draw Horizontal Leader Tick
Leader Offset Scaler: 0.05
☑ Use Separate Leader Layer LABEL_LEADER
☐ Keep Label Alignment

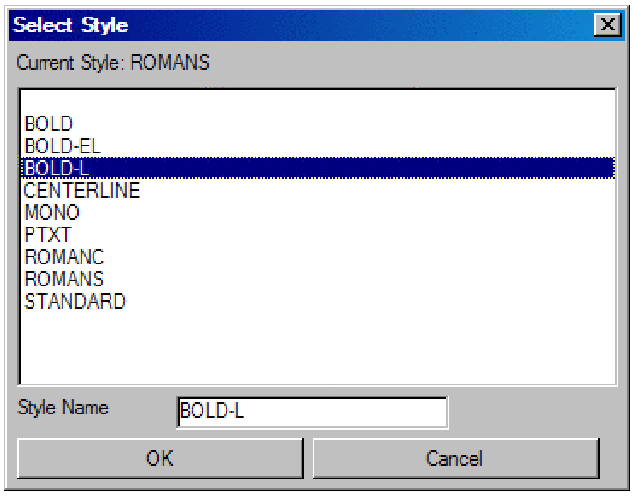
Minimum Leader Length Scaler: If the distance of the move is less than this value, a leader will not be drawn.
Draw Horizontal Leader Tick: When checked, a horizontal leader tick will be drawn from the end of the leader towards the annotation.
Leader Offset Scaler: This is used to set the distance from the end of the leader and the annotation.
Use Separate Leader Layer: This allows the user to place the leader on a separate layer from the annotation.
Keep Label Alignment: This option keeps the original text angle. Otherwise the leadered text is orientated horizontally to the current twist screen.
NOTE: The leader scaler units (Minimum Leader Length Scaler and Leader Offset Scaler) are multiplied by the current horizontal scale value which is set under Drawings Setup.
Select Label to Move (O for Options,R for Restore): R
Select Label to Restore: pick a text that had been moved with the "Move with Leader" command previously.

The selected label will be restored to its previous state.

Pulldown Menu Location: Edit > Text
Keyboard Command: movetext
Prerequisite: Text entity to move.

Change Text Font

This command can change multiple text entities to a user specified style. The routine prompts for a selection set of TEXT and/or MTEXT objects. Once the selection is made, the Select Style dialog appears. You can then select a text Style Name, such as MONO or ROMANS, that you would like to change to. Click OK. To the right on Style Name, you can enter a style name that does not exist. If you do, it will be created for you using the font with the same name.



Current Style: ROMANS

Style Name: BOLD-L

Pulldown Menu Location: Edit > Text
Keyboard Command: chgtxtstyle
Prerequisite: Text entities to be changed

Change Text Size

This command will change the size of the selected text objects to the user specified size. The *Text Enlarge/Reduce* command also changes text size. The difference is that this routine sets the text to an absolute size whereas *Text Enlarge/Reduce* scales, or relatively changes, the text size.

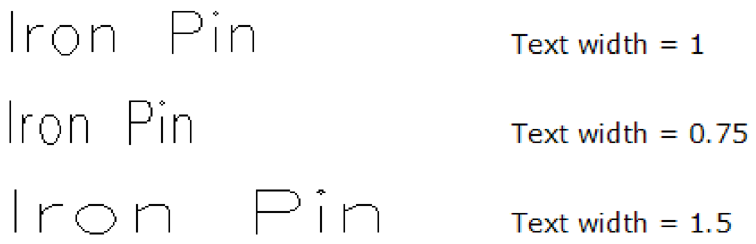
Prompts

Select the text to size.
Select objects: *select the text*
Enter new text size: *enter value*

Pulldown Menu Location: Edit > Text
Keyboard Command: chgtxtsize
Prerequisite: Text entities to be changed

Change Text Width

This command changes the width of the selected text entities, after a new width factor is entered. The insertion point of each text entity is maintained as the routine lengthens or shortens the text.



Effect of different width factors on the same text line

Prompts

Select the text to change.
Select objects: *select text entities*
Enter new width factor <1.0>: *enter new width factor*

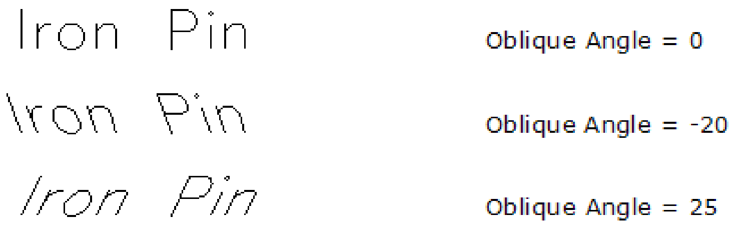
Pulldown Menu Location: Edit > Text
Keyboard Command: chgtxtwidth
Prerequisite: Text entities to be changed

Change Text Oblique Angle

This command allows you to change the text oblique angle on existing text in the drawing. The oblique angle for a specific text style is defined during the creation of the style. The default value for the oblique angle for text styles is 0 until defined to another value by the user. When changing the oblique angle, a minus (-) sign in front of the angle indicates a backward slant and a positive value results in a forward slant. Remember that the reference base point for the oblique change is always 0 degree. This means that if an existing text string has an oblique angle of 20, changing the oblique angle to 25 will not add 25 degrees to the existing 20 degree oblique resulting in a text oblique angle of 45 degrees, but rather a 25 degree oblique will be established by referencing 0 oblique as the base, and then slanting the text to 25 degrees. This works the same for slanting text backward as well as forward. Below is an example showing original text created with the default oblique angle of zero, then changed to a backward slant of 20 and a forward slant of 25 degrees.

Prompts

Select the text to change.
Select objects: *Select text to change oblique angle on.* Note that one or more text strings can be selected. When all desired text has been selected, press Enter.
Enter new oblique angle <0.0>: Enter the desired oblique angle.



Pulldown Menu Location: Edit > Text
Prerequisite: Text entities to be changed
Keyboard Command: chgtxtoblique

Flip Text

This command will change the alignment of text entities by 180 degrees.

Pulldown Menu Location: Edit > Text
Keyboard Command: fliptext
Prerequisite: Text entities to be changed

Flip Text By Twist Screen

This command will change the alignment of text entities by 180 degrees for any selected text that are upside-down relative to the current drawing twist screen (dview twist).

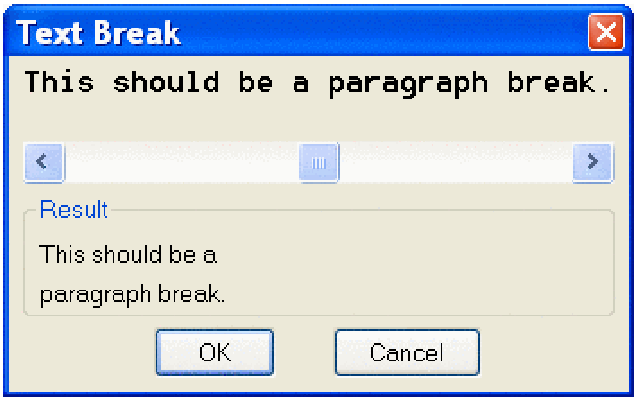
Prompts

Select Text to Flip for Twist Screen.
Select objects: *pick the entities*

Pulldown Menu Location: Edit > Text
Keyboard Command: annflip
Prerequisite: Text entities to be changed

Split Text into Two Lines

This tool allows you to break a single line of TEXT into two separate lines. First, select the text string you would like to break. The Text Break dialog then appears. Initially, the slider is all the way to the right. Begin dragging it toward the left until it reaches the point where the split is at the desired position. Then choose OK to complete the break operation.



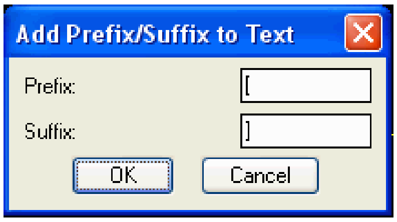
This should be a paragraph break.

This should be a
paragraph break.

Pulldown Menu Location: Edit > Text
Keyboard Command: txtbrk
Prerequisite: Text entity to break

Add Prefix/Suffix To Text

This command simply adds a prefix and/or suffix to the selected text entities. The strings to add are specified in a dialog. Then you select the text entities to update.



Prefix: [
Suffix:]

Prompts

Add Prefix/Suffix To Text dialog
Select text to process.
Select objects: *pick the text entities*

Pulldown Menu Location: Edit > Text
Prerequisite: Text entities to be changed
Keyboard Command: txtwrap

Remove Spaces From Text

This command removes leading and/or trailing spaces from the selected text entities.

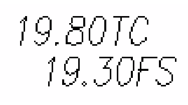
Prompts

Trim all spaces from text on [Right/Left/<Both>]: *press Enter*
Select text to process.
Select objects: *pick the text entities to process*
Trimmed spaces from 1 text entities.

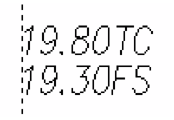
Pulldown Menu Location: Edit > Text
Keyboard Command: txtrmspace
Prerequisite: Text entities

Line Up Text

This command lines up the selected text entities along either a horizontal or vertical line position.



Before and after Line Up Text



Prompts

Line up text on [Horizontal/<Vertical>]: *press Enter for Vertical*
Pick vertical position: *pick a point*
Select text to process.
Select objects: *select the text to process*

Pulldown Menu Location: Edit > Text
Keyboard Command: txtlineup
Prerequisite: Text

Join Text Entities

This command combines two text entities by appending the second text to the first. The Words join method puts a space between each text. The Letter join method appends without a space.

Prompts

Select first text line: *pick a text entity*
Select text to add to first text line: *pick a text entity*
Join type as [Words/<Letters>]: *press Enter*

Pulldown Menu Location: Edit > Text
Keyboard Command: txtjoin
Prerequisite: Text entities

Replace Text

This command will replace one text string with another. For example, if the text LEGEL is on a drawing, you could use this command to replace it with LEGAL. In AutoCAD 2000 and later, the command *Find and Replace Text* includes more options, including replacing partial strings and searching attributes and MTEXT.

Pulldown Menu Location: Edit > Text
Keyboard Command: chgtext
Prerequisite: Text entities to be changed

Image Frame

This command controls whether TakeOff displays the image frame or hides it from view.

Because you select an image by clicking its frame, setting the image frame to off prevents you from selecting an image.

Prompts

1 Enter image frame setting [ON/OFF] <current>: **enter an option or Press Enter**

- **On**: Displays image frames so you can select images.
- **Off**: Hides image frames so you cannot select images.

Prerequisite: None

Keyboard Command: IMAGEFRAME

Image Clip

This command allows you to create new clipping boundaries for an image object.

Prompts

1 Select image to clip: select the edge of an image

2 Enter image clipping option [ON/OFF/Delete/New boundary] <New>: **enter an option or Press Enter**

The boundary you specify must be in a plane parallel to the image object.

- **On**: Turns on clipping and displays the image clipped to the previously defined boundary.
- **Off**: Turns off clipping and displays the entire image and frame. If you reclip the image while clipping is turned off, the program automatically turns clipping back on. The program prompts you to delete the old boundary even when clipping is turned off and the clipping boundary is not visible.
- **Delete**: Removes a predefined clipping boundary and redisplays the full original image.
- **New Boundary**: Specifies a new clipping boundary. The boundary can be rectangular or polygonal, and consists only of straight line segments. When defining a clipping boundary, specify vertices within the image boundary. Self-intersecting vertices are valid. Rectangular is the default option. If you use the pointing device to specify a point at the Enter Clipping Type prompt, the program interprets the point as the first corner of a rectangle.

3 Enter clipping type [Polygonal/Rectangular] <Rectangular>: **enter P or Press Enter**

- **Polygonal**: Uses specified points to define a polygonal boundary.

Specify first point: Specify a point

Specify next point or [Undo]: **specify a point or enter u**

Specify next point or [Undo]: **specify a point or enter u**

Specify next point or [Close/Undo]: **specify a point, or enter c or u**

You must specify at least three points to define a polygon.

If the image already has a clipping boundary defined, TakeOff displays the following prompt:

Delete old boundary? [No/Yes] <Yes>: **enter N or Press Enter**

If you choose Yes, the program redraws the entire image and the command continues; if you choose No, the command ends.

- **Rectangular**: Specifies a rectangular boundary by its opposite corners. TakeOff always draws the rectangle parallel to the edges of the image.

Specify first corner point: **specify a point**

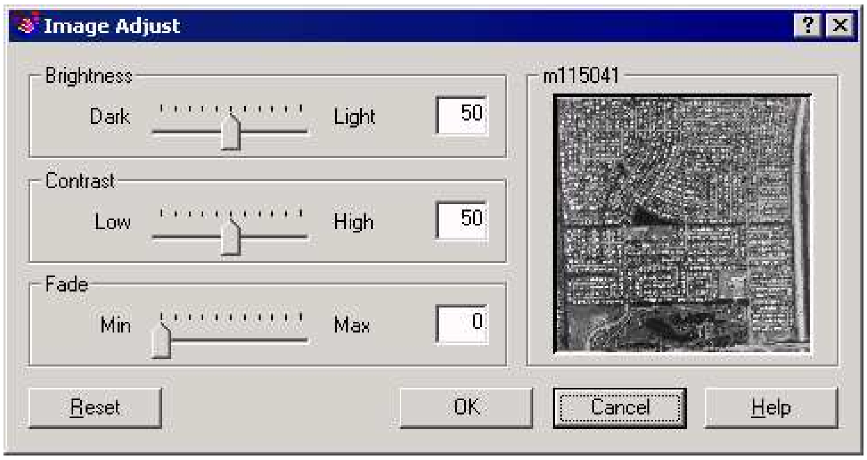
Specify opposite corner point: **specify a point**

Prerequisite: None

Keyboard Command: IMAGECLIP

Image Adjust

This command controls the display of the brightness, contrast, and fade values of images.



The Image Adjust dialog box controls how the image is displayed by adjusting the brightness, contrast, and fade settings of the selected image. Adjusting these values changes the display of the image but does not change the image file itself.

- **Brightness**: Controls the brightness, and indirectly the contrast, of the image. Values range from 0 through 100. The greater the value, the brighter the image and the more pixels that become white when you increase contrast. Moving the slider to the left decreases the value; moving the slider to the right increases the value.
- **Contrast**: Controls the contrast, and indirectly the fading effect, of the image. Values range from 0 through 100. The greater the value, the more each pixel is forced to its primary or secondary color. Moving the slider to the left decreases the value; moving the slider to the right increases the value.
- **Fade**: Controls the fading effect of the image. Values range from 0 through 100. The greater the value, the more the image blends with the current background color. A value of 100 blends the image completely into the background. Changing the screen background color causes the image to fade to the new color. In plotting, the background color for fade is white. Moving the slider to the left decreases the value; moving the slider to the right increases the value.
- **Image Preview**: Displays a preview of the selected image. The preview image updates dynamically to reflect changes to the brightness, contrast, and fade settings.
- **Reset**: Resets values for brightness, contrast, and fade to default settings (50, 50, and 0, respectively).

Prerequisite: None

Keyboard Command: IMAGEADJUST

Remove Groups

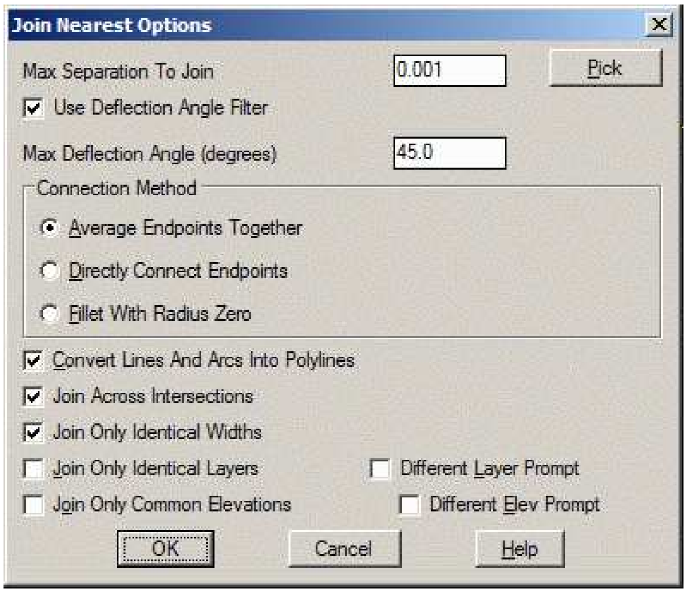
This command breaks up AutoCAD groups into more managable entities.

Prerequisite: Groups

Keyboard Command: rmgroup

Join Nearest

This command joins lines, arcs and/or polylines together. While the *PEDIT-Join* command requires the endpoints to match, Join Nearest will allow you to join entities whose endpoints do not exactly meet. You specify the maximum separation distance to join, along with other options, in the dialog box shown below. Also you can join many entities at once.



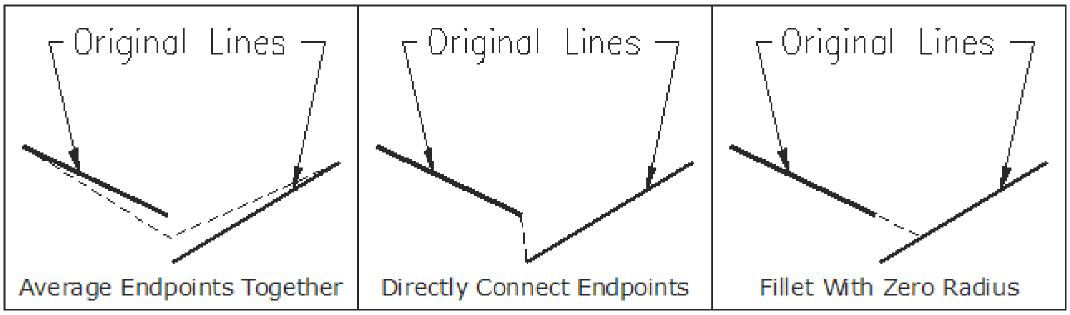
Max Separation To Join: 0.001
☑ Use Deflection Angle Filter
Max Deflection Angle (degrees): 45.0
Connection Method
● Average Endpoints Together
○ Directly Connect Endpoints
○ Fillet With Radius Zero
☑ Convert Lines And Arcs Into Polylines
☑ Join Across Intersections
☑ Join Only Identical Widths
☐ Join Only Identical Layers
☐ Different Layer Prompt
☐ Join Only Common Elevations
☐ Different Elev Prompt

Max Separation to Join: Entities whose endpoints are spaced apart greater than this value will not be joined. You may use the pick button to specify this value by picking two points on the screen.
Max Deflection Angle (degrees): This option will not join any lines if the angle between them is greater than this angle in degrees.
Connection Method: Determines how to connect the endpoints. See the illustration below.

1. **Average Endpoints Together:** New vertex will be located at midpoint between two original endpoints (see illustration below on left).
2. **Directly Connect Endpoints:** Original endpoints are connected with new segment (see the middle illustration below).
3. **Fillet with Radius Zero:** Same as the *FILLET* command using zero radius (see the illustration on right).

Convert Lines and Arcs Into Polylines: When checked, automatically converts lines and arcs into polylines. If not checked, lines and arcs are joined but remain separate entities.
Join Across Intersections: This option applies to cases where more than two linework endpoints come together such as a Y intersection. In these cases, there are multiple possible connections. When this option is on, the program will automatically choose one of the possible connections. Otherwise, the program will not connect any of them.
Join Only Identical Widths: When checked, only polylines with the same width will be joined.
Join Only Identical Layers: When checked, only entities on the same layer will be joined.
Join Only Common Elevations: When checked, only endpoints located on the same elevation will be joined.
Different Layer Prompt: When Join Only Identical Layers is off, then this option will prompt for which layer to use when it finds a connection between two different layer names.
Different Elevation Prompt: When Join Only Common Elevations is off, then this option will prompt for which

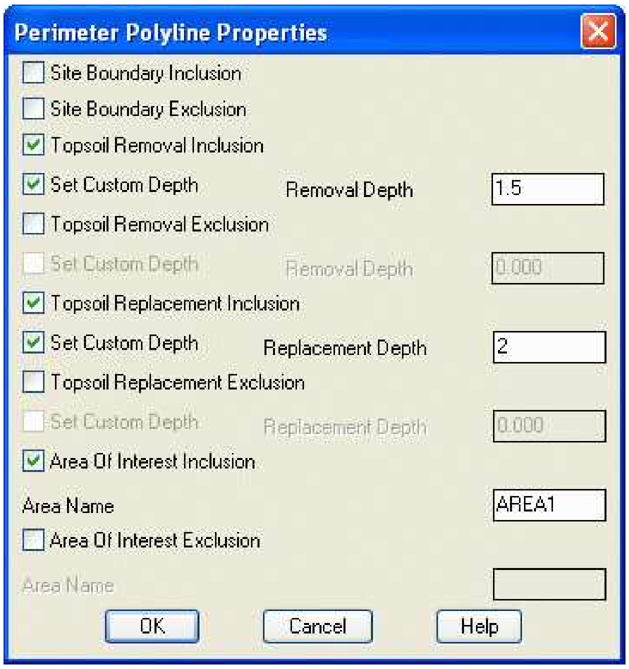
elevation to use when it finds a connection between two different elevations.


Original Lines
Average Endpoints Together
Original Lines
Directly Connect Endpoints
Original Lines
Fillet With Zero Radius

Pulldown Menu Location: Edit
Keyboard Command: nearjoin
Prerequisite: Lines or polylines to be joined

Perimeter Polylines Properties

This command allows you to control the properties of any perimeter polyline (Note: Perimeter polylines also have to be closed polylines). Select a polyline and the following dialog appears. Here you can define the functionality of the polyline in regards to, the Site Boundary, Areas of Interest, and Topsoil Removal/Replacement. These properties can also be set separately using the Boundary Polyline, Areas of Interest, and Topsoil Removal/Replacement commands found under the Tools menu of Carlson Takeoff.


Perimeter Polyline Properties

☐ Site Boundary Inclusion
☐ Site Boundary Exclusion
☑ Topsoil Removal Inclusion
☑ Set Custom Depth Removal Depth 1.5
☐ Topsoil Removal Exclusion
☐ Set Custom Depth Removal Depth 0.000
☑ Topsoil Replacement Inclusion
☑ Set Custom Depth Replacement Depth 2
☐ Topsoil Replacement Exclusion
☐ Set Custom Depth Replacement Depth 0.000
☑ Area Of Interest Inclusion
Area Name AREA1
☐ Area Of Interest Exclusion
Area Name

OK
Cancel
Help

Prerequisite: a polyline
Keyboard Command: perim_prop

Entities to Polylines

This command converts selected lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids into individual polylines. Use *Join Nearest* to convert adjoining lines and arcs into continuous polylines.

Prompts

Select lines, arcs, circles, 3DFaces, ellipses, splines, multilines, regions and solids to convert.
Select objects: *select entities*

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: topline
Prerequisite: lines, arcs or other entities to convert

Reverse Polyline

This command reverses the order of the line and/or arc segments of a *POLYLINE*. This can be useful in conjunction with the commands *Station Polyline*, *MXS by Polyline*, *Profile from Surface Model* or *CL File from Polyline*, since the polyline must be plotted in the direction of increasing stations. If it is more convenient to draft a polyline in one direction do so and then use the *Reverse Polyline* command to change its order. Temporary arrows along the polyline are drawn to graphically show the new polyline direction.

Prompts

Select the Polyline to Reverse: *pick a point on polyline*

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: revpline
Prerequisite: A polyline

Reduce Polyline Vertices

This command removes points from a polyline, without significantly changing the polyline. The offset cutoff is the maximum amount that the polyline can move horizontally and vertically when removing a point. For example, in a polyline with three points in a straight line, the middle point can be removed without changing the polyline. This command is explained further in the *Triangulate & Contour* command.

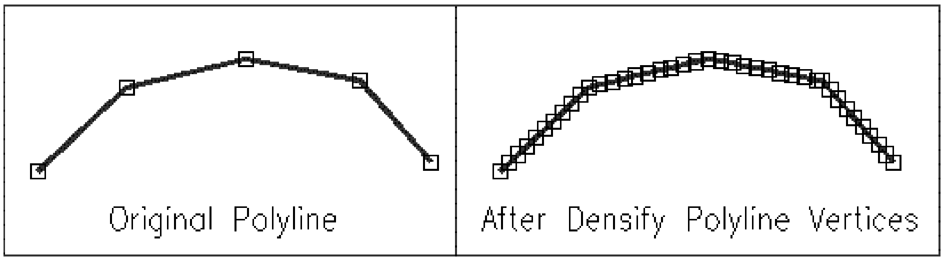
Prompts

Enter the offset cutoff <0.1>: *.5*
Select polylines to reduce.
Select objects: *pick polylines*
Processed polylines: 1
Total number of vertices: 10
Number of vertices removed: 1

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: reduce
Prerequisite: A polyline

Densify Polyline Vertices

This command adds vertices to the selected polylines at the specified interval. These points are interpolated between existing points in the polyline. This command is the opposite of Reduce Polyline Vertices.



Prompts

Select polylines to densify.
Select objects: *select polylines*
Point interval <10.0>: *press Enter*
Testing Entity> 1
Added 17 points to 1 polyline.

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: densepl
Prerequisite: A polyline

Smooth Polyline

This command smooths the selected polylines using a modified Bezier method that makes the smooth polyline pass through all the original points and only smooths between the original points. The looping factor controls smoothing amount. A higher factor gives more looping. This command is explained further in the Surface menu section.

Prompts

Enter the looping factor (1-10) <5>: *7*
Enter the offset cutoff <0.05>: *press Enter* This is the same reducing filter described above.
Select polylines to smooth.
Select objects: *pick polylines*
Smoothed 1 PolyLines
Total original vertices: 9 Total final vertices: 50

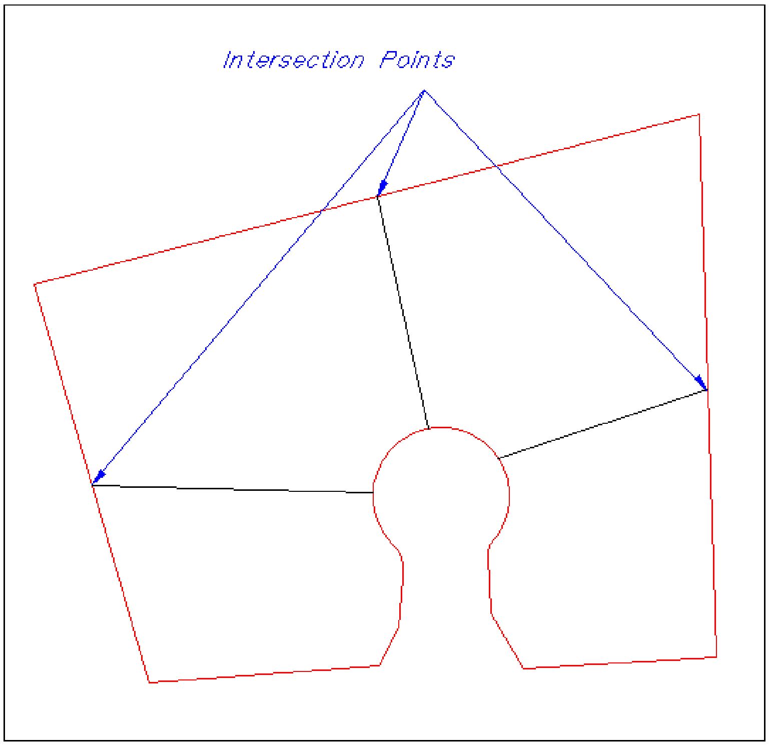
Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: smoothpl
Prerequisite: A polyline

Add Intersection Points

This command adds points into lines or polylines where there are intersections. This can be useful for other commands such as Auto-Annotate. For example in the drawing shown, Add Intersection Points adds points to the boundary polyline where the lot lines intersect. Then Auto Annotate for the boundary polyline will label the boundary distance along each lot. This routine does not add intersection points on arcs.

Prompts

Select lines and polylines to check.
Select objects: *pick lines or polylines*
Reading the selection set ...
Adding intersection points ...
Added 3 intersection points.



Pulldown Menu Location: Edit > Polyline Utilities > Edit Polyline
Keyboard Command: addint
Prerequisite: Polylines or lines

Add Polyline Vertex

This command adds points into a polyline. First you select the polyline to modify. The existing polyline vertices are marked and then you can pick or enter the coordinates for the new point(s). A new point is inserted into the polyline at the nearest polyline segment. On a 3D polyline, the elevation of the new vertex will be calculated for you. You can continue to pick points to add. Press Enter when you are done.

Prompts

Select polyline to add to: *pick a polyline*
Pick or enter point to add: *pick a point*
Select polyline to add to: *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities > Edit Polyline
Keyboard Command: addpl
Prerequisite: A polyline

Add Point by Two Slopes

This command inserts a vertex into a 3D Polyline between two points based on the slopes specified for these two points on polyline.

Prompts

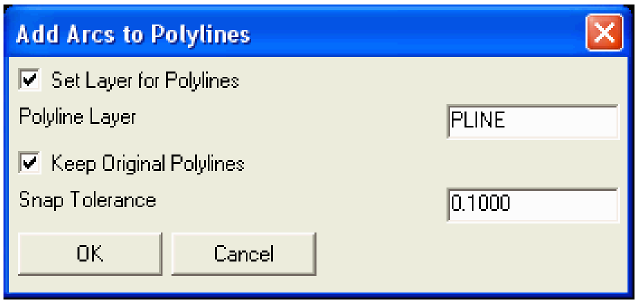
Select polyline to process: *select a polyline*
Select first point on polyline: *select a point on polyline*
Enter percent slope from first point: *-1.0*
Select second point on polyline: *select a second point on polyline*
Enter percent slope from second point: *-1.0*

Pulldown Menu Location: Edit > 3D Polyline Utilities
Keyboard Command: plzslopes
Prerequisite: 3D Polylines

Add Polyline Arcs

This command replaces a series of short chord line segments in a polyline with an arc segment. This applies where you want to have a true arc instead of a series of line segments. In some cases, the CAD drafting has the arcs drawn as a series of short chords. Another application is to create an arc out of a series of connected survey points along the curve. The routine works by searching for a series of polyline vertices that fit within the specified tolerance with a best fit curve.

The options dialog allows you to set the layer for the new polylines. Otherwise the original polyline layer is used. There is an option whether to keep or erase the original polylines. The Snap Tolerance is the maximum offset allowed between the original points and the arc.


Add Arcs to Polylines

☑ Set Layer for Polylines
Polyline Layer: PLINE
☑ Keep Original Polylines
Snap Tolerance: 0.1000

Prompts

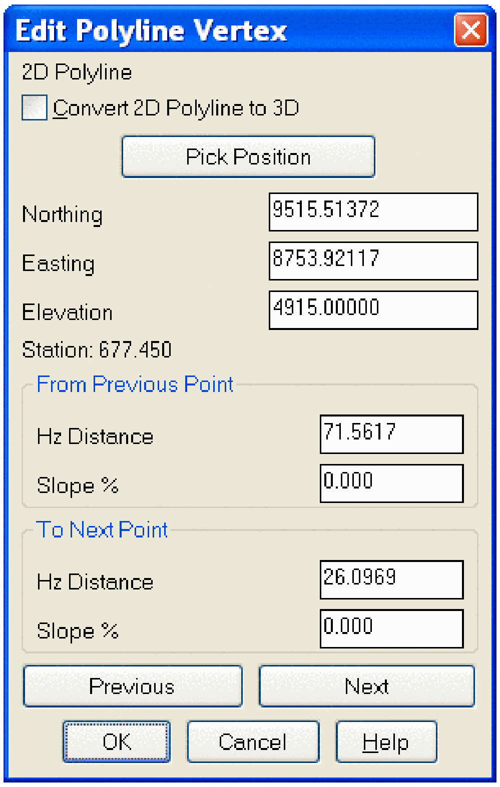
Add Arcs to Polylines dialog
Select polylines to process.
Select entities: *pick the polylines*

Pulldown Menu Location: Edit > Polyline Utilities > Edit Polyline
Keyboard Command: addplarc
Prerequisite: polyline

Edit Polyline Vertex

This tool allows you to make changes in the coordinates of vertices on all polyline types. Upon execution, you will be asked to select a polyline to edit. Upon selection, a temporary marker will be placed at all of the vertices of the polyline, making them easy to distinguish. You must then pick near the vertex you wish to edit. The following dialog appears.

At the top of the dialog it identifies the type of polyline as being 2D or 3D. In the case of 2D polylines, it allows you convert the polyline. You have the ability to type in new northing, easting or elevation values. You can also determine the 3D coordinate position by using distances and slope to/from adjacent points. As you change the values in the dialog, new values for derivatives are being calculated. For example, if you change the horizontal distances, the coordinates will change.



2D Polyline

☐ Convert 2D Polyline to 3D

Northing 9515.51372

Easting 8753.92117

Elevation 4915.00000

Station: 677.450

From Previous Point

Hz Distance 71.5617

Slope % 0.000

To Next Point

Hz Distance 26.0969

Slope % 0.000

Prompts

Select polyline to edit: *pick a polyline*
Pick point on polyline to edit: *pick a point to be modified*
Edit Polyline Vertex dialog *click "Pick Position"*
Pick vertex position: *pick a new location for the vertex*
Edit Polyline Vertex dialog *click OK*
Make changes as needed. You will see the polyline vertices relocated based upon the new picked positions and coordinate changes. Use Previous and Next to move along the polyline. Note the dialog values changing.
Select polyline to edit (Enter to end): *press Enter to end*

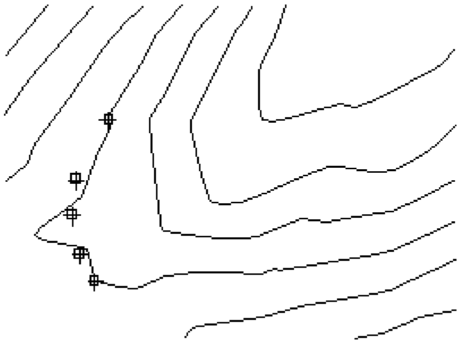
Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: editpl
Prerequisite: A polyline

Edit Polyline Section

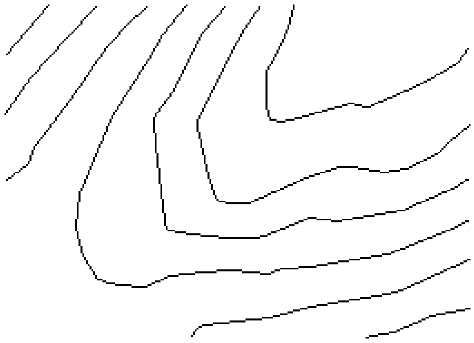
This command revises a segment of a polyline. Begin by picking a point on the polyline where you want to start editing. Then pick new points for the polyline. When finished picking new points press Enter, and then pick a point on the polyline to connect with the new points. The polyline segment between the start and end points is then replaced with the new points.

Prompts

Select polyline to edit: *pick the polyline at the place to start editing*
Pick intermediate point (Enter to End): *pick a point*
Pick intermediate point ('U' to Undo, Enter to End): *pick a point*
Pick intermediate point ('U' to Undo, Enter to End): *press Enter*
Pick reconnection point on polyline: *pick the polyline at the place to join*



Edit this contour by picking new points



Contour with segment replaced with new points

Pulldown Menu Location: Edit > Polyline Utilities > Edit Polyline
Keyboard Command: editpl2
Prerequisite: Polylines

Change Polyline Width

This command sets the width of the selected polylines. In later versions of AutoCAD, the command *PEDIT* can also modify the width of multiple polylines.

Prompts

New width <1.0>: *2*
Select Polylines/Contours to change width of:
Select objects: *pick polylines*

Pulldown Menu Location: Edit > Polyline Utilities > Edit Polyline
Keyboard Command: cwidth
Prerequisite: A polyline

Set Polyline Origin

This command sets the starting vertex of a closed polyline. Simply pick the polyline and then pick near the point to set as the starting point.

Prompts

Select Polyline: *pick a polyline*
Pick Near New Origin Point: *pick a point on the polyline to be the starting point*
Processing ...
Select Polyline: *press Enter*

Pulldown Menu Location: Edit > Polyline Utilities > Edit Polyline
Keyboard Command: plchgorg
Prerequisite: A closed polyline

Close Polyline

This command allows you to close a selection set of open polylines.

Prerequisite: Open polyline(s).

Keyboard Command: CLOSEPL

Open Polyline

This command allows you to open a selection set of closed polylines.

Prerequisite: Closed polyline(s).

Keyboard Command: OPENPL

Remove Polyline Arcs

This command replaces arc segments in polylines with chords. Removing arcs is a prerequisite to some Carlson commands that don't handle arcs, such as *Break by Closed Polyline* and *Make 3D Grid File*. This process can add many vertices to the polyline. The Offset cutoff is the maximum any point on the arc will be allowed to shift.

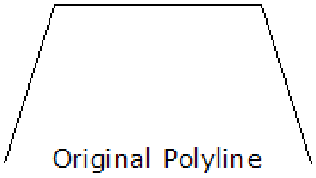
Prompts

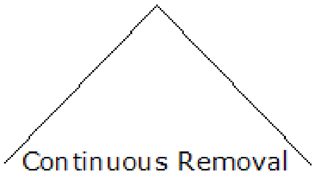
Select polylines to remove arcs from.
Select objects: *pick polylines*
Offset cutoff <0.5>: *press Enter*

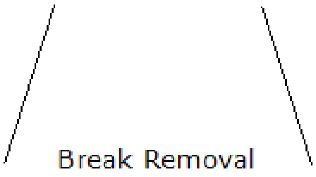
Pulldown Menu Location: Edit > Polyline Utilities > Remove Polyline
Keyboard Command: rmarc
Prerequisite: polyline with arcs

Remove Polyline Segment

This command removes the user specified segment from a polyline. A polyline segment is the section between two vertices of the polyline. There are two options for removing the segment. Either the two vertices of the removed segments are averaged together to keep polyline continuous, or the segment is left missing in the polyline, which creates two separate polylines. The keywords Continuous and Break respectively identify these two options. The first image is of the Original Polyline. The second is with the Continuous Removal option. The third is using the Break Removal option.







Prompts

Break polyline at removal or keep continuous (Break/<Continuous>)? *press Enter*
Select polyline segment to remove: *pick point on polyline*
Select polyline segment to remove: *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities > Remove Polyline
Keyboard Command: removepl
Prerequisite: A polyline

Remove Polyline Vertex

This command removes vertices from a polyline. First you select the polyline to modify. The existing polyline vertices are marked and then you pick near the vertex you wish to delete. You can continue to pick vertices to delete, press Enter when you are done.

Prompts

Select polyline to remove from: *pick point on polyline*
Pick point to remove: *pick point*
Pick point to remove (Enter to end): *press Enter to end*

Pulldown Menu Location: Edit > Polyline Utilities > Remove Polyline
Keyboard Command: rmvertex
Prerequisite: A polyline

Tag Hard Breakline Polylines

This command tags polylines with a description so that Triangulate & Contour can identify these polylines as hard breaklines. The tag is invisible and doesn't change the polyline. Triangulate & Contour will not smooth the contours as they crosses these hard breaklines. For example you could tag 3D polylines that represent a wall so that the contours go straight across the wall without smoothing curves.

Prompts

Select hard breaklines.

Select objects: *select polylines*

Prerequisite: Polylines.

Keyboard Command: hardbrk

Untag Hard Breakline Polylines

This command removes description tags from polylines. These tags are used by Triangulate & Contour to identify polylines as hard breaklines. Contours are not smoothed as they cross these hard breaklines. This routine untags polylines so that contours are smoothed across them.

Prompts

Select polylines to remove hard breakline tag from.

Select objects: *select polylines*

Prerequisite: Polylines with hard breakline tag.

Keyboard Command: softbrk

Remove Duplicate Polylines

This command analyzes the selected polylines and erases any duplicate polylines found. They must be exactly the same for one to be deleted.

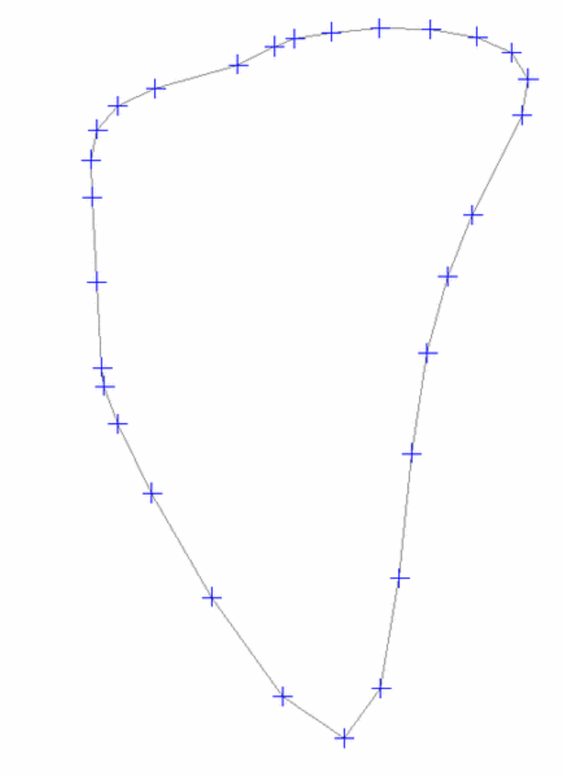
Prompts

Select lines, arcs and polylines to process.
Select objects: *select linework to process*
Reading the selection set ...
Removed 1 duplicate linework entities.

Pulldown Menu Location: Edit > Polyline Utilities > Remove Polyline
Keyboard Command: rmduplwork
Prerequisite: Polylines that have duplicates

Draw Polyline Blips

This command will draw temporary markers, "blips", at each polyline vertex. This allows you to identify the actual location of each vertex. The Blips are temporary. Any change to the viewport (pan, zoom, regen) will make the blips disappear. In later versions of AutoCAD, you can also click on the polyline to activate the grips which will remain visible during and after viewport changes.



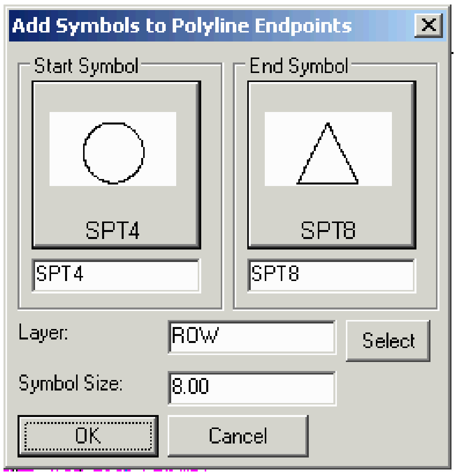
Prompts

Select polylines to draw blips.
Select objects: *select polyline(s)*

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: plblip
Prerequisite: A polyline

Draw Polyline Start/End

This command simply draws symbols at the start and end vertices of a polyline to give a visual indication of the polyline direction. The routine starts with a dialog to select the different symbols for the start and end, and to select the layer and size for the symbols. Then you select the polylines and the program draws the symbols.



Add Symbols to Polyline Endpoints
Start Symbol
End Symbol
SPT4
SPT8
Select
OK
Cancel

Start Symbol: SPT4
End Symbol: SPT8
Layer: ROW
Symbol Size: 8.00

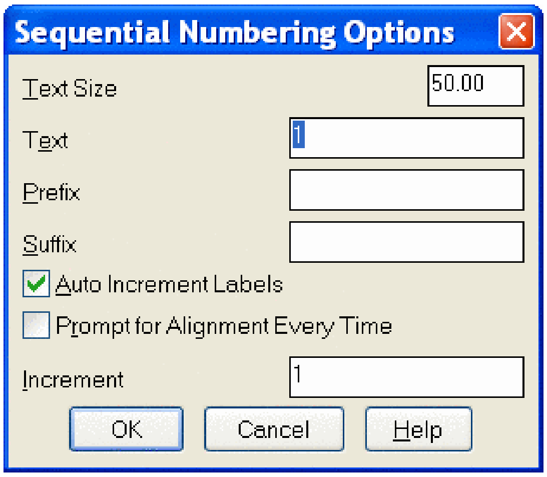
Prompts

Polyline Start/End Settings dialog
Select polylines.
Select objects: *select polyline(s)*

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: plends
Prerequisite: A polyline

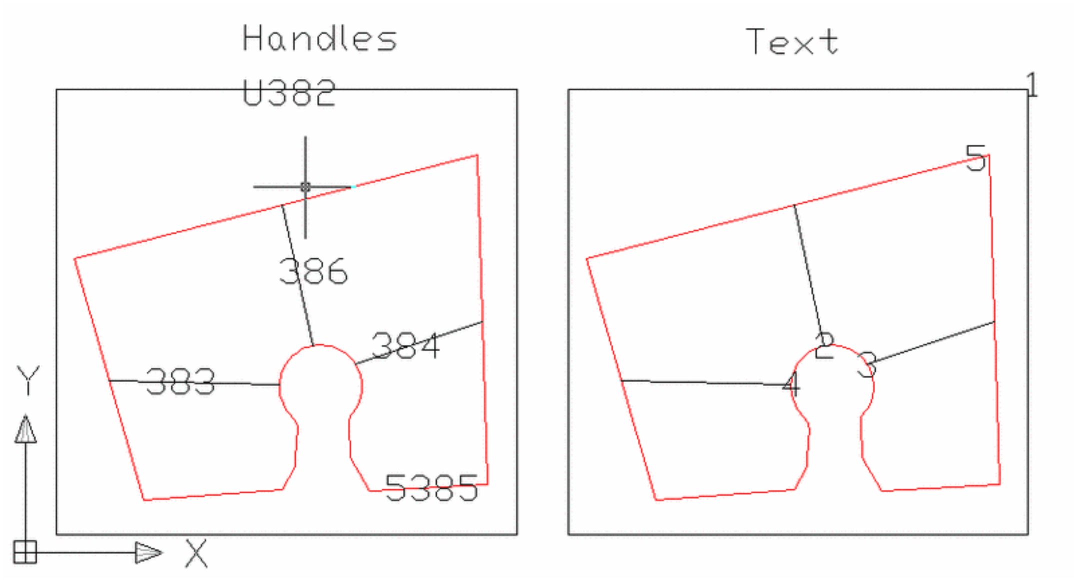
Create Polyline ID Labels

This command labels the selected polylines with either the entity "Handle", which can be seen with a list, or with unique text numbers, such as 1, 2, 3, 4, etc.. When using the Text option, the following window appears to choose the text settings.



Sequential Numbering Options
OK
Cancel
Help

Text Size: 50.00
Text: 1
Prefix:
Suffix:
☑ Auto Increment Labels
☐ Prompt for Alignment Every Time
Increment: 1



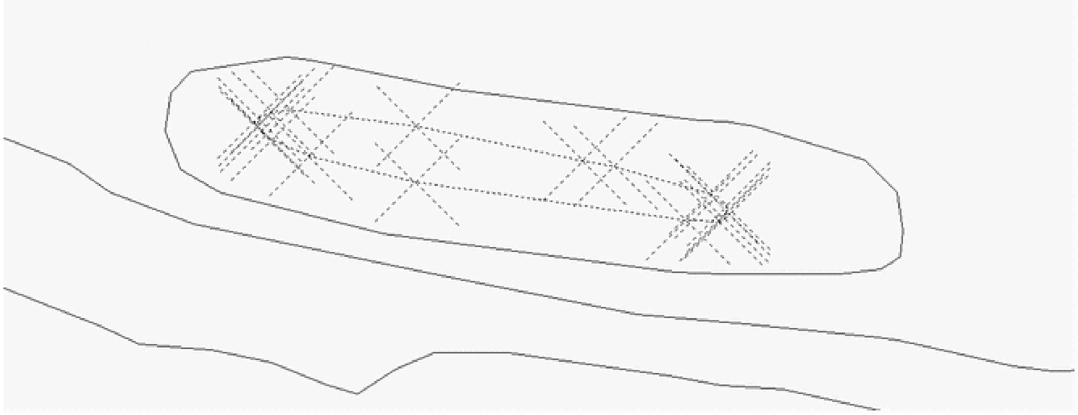
Prompts

Select Polylines to label.
Select objects: *pick polyline*
Label polylines by Text or Handles [Handles/<Text>]? *press Enter*

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: label_polys
Prerequisite: A polyline

Check Elevation Range

This command analyzes a selection set of polylines, and highlights the ones that fall outside of a specified elevation range. There is an option to set the polylines that are outside of the range to zero. Every polyline vertex that is outside of the range will be highlighted with an X.



Prompts

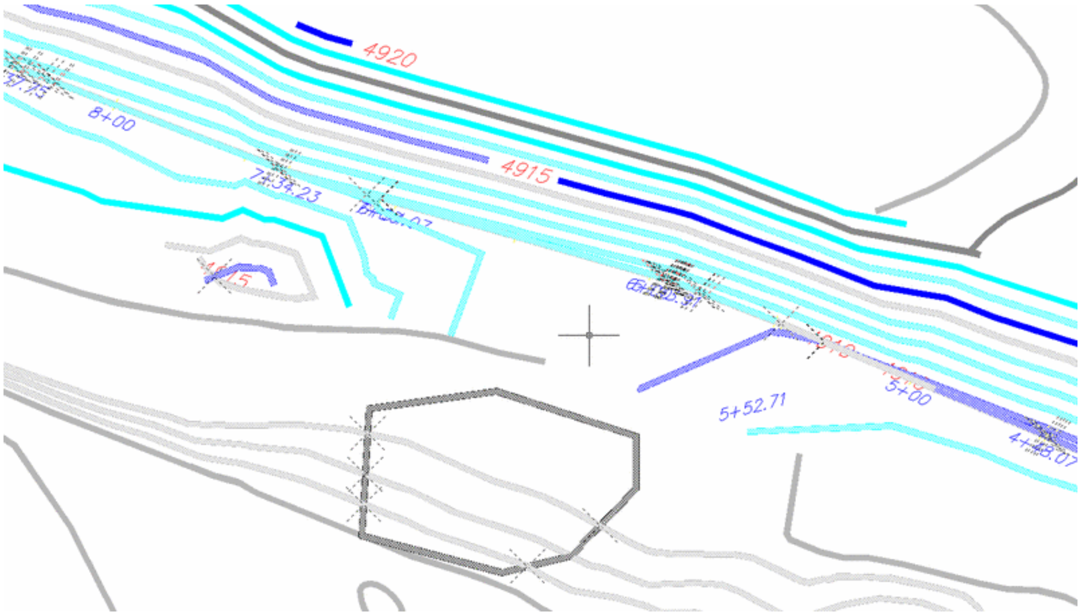
Enter elevation range minimum: *0*
Enter elevation range maximum: *4900*
Select polylines to check.

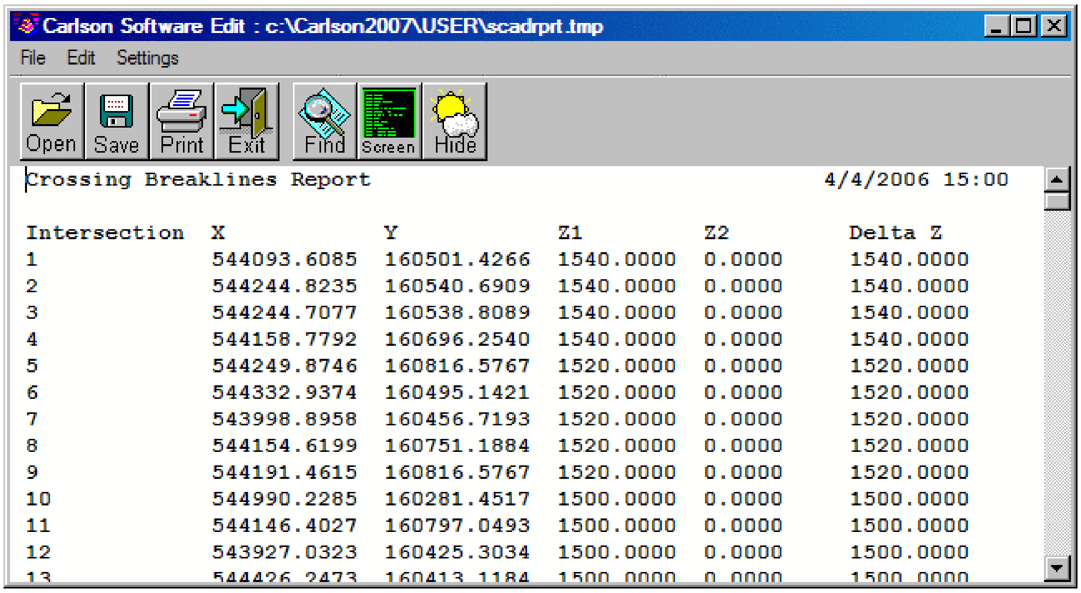
Select objects: *pick polylines to process*
Found 1 polylines outside of elevation range.
Set polylines outside elevation range to zero elevation [Yes/<No>]? *N*

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: checkpl
Prerequisite: Polylines with elevations

Highlight Crossing Plines

This command highlights selected polylines that are crossing in the drawing and have different elevations at the crossing. Every intersection point where the polylines cross are marked with a temporary X. A report is provided at the end where the X and Y of the intersection points are displayed with the two Z values and the Z difference. The command has the ability to repair crossing polylines by inserting a vertex in each polyline at the intersection and assigning a common elevation at this intersection.





```
Crossing Breaklines Report                                    4/4/2006 15:00

Intersection  X            Y            Z1          Z2          Delta Z
1             544093.6085  160501.4266  1540.0000   0.0000      1540.0000
2             544244.8235  160540.6909  1540.0000   0.0000      1540.0000
3             544244.7077  160538.8089  1540.0000   0.0000      1540.0000
4             544158.7792  160696.2540  1540.0000   0.0000      1540.0000
5             544249.8746  160816.5767  1520.0000   0.0000      1520.0000
6             544332.9374  160495.1421  1520.0000   0.0000      1520.0000
7             543998.8958  160456.7193  1520.0000   0.0000      1520.0000
8             544154.6199  160751.1884  1520.0000   0.0000      1520.0000
9             544191.4615  160816.5767  1520.0000   0.0000      1520.0000
10            544990.2285  160281.4517  1500.0000   0.0000      1500.0000
11            544146.4027  160797.0493  1500.0000   0.0000      1500.0000
12            543927.0323  160425.3034  1500.0000   0.0000      1500.0000
13            544426.2473  160413.1184  1500.0000   0.0000      1500.0000
```

Prompts

Select polylines to check.
Select objects: *pick polylines to process*
Ignore zero elevations [<Yes>/No]? *press Enter for Yes to filter out polylines at zero elevation*
Reading points ... 1677
Finding points on breaklines ...
19 crossing polylines are highlighted.
Use Report Formatter [Yes/<No>]? *press Enter for No.* Use the Report Formatter to customize the report layout or export to Excel.
Minimum delta Z to report <0.0>: *2*
Add polyline vertices at intersections [Yes/<No>]? *Y*
Set 3D polyline to crossing contour elev or average elevs [Set/<Average>]? *press Enter for Average.* The Set option applies to crossing polylines where one polyline is a 3D polyline with varying elevations and the other polyline is a contour polyline with a fixed elevation. For this case, the Set method will hold the elevation of the contour polyline and set the 3D polyline elevation to match the contour. The Average method sets the elevation of the intersection point as the average of the crossing polyline elevations at that point.
Maximum delta Z to average <1.0>: *press Enter.* This option will only add the intersection point with the averaged elevation if the elevation difference is less than this tolerance.

Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: xing_plines
Prerequisite: Polylines with elevations

Highlight Non-Perpendicular Intersections

This command highlights selected polylines that have T-intersections with other polylines that are non-perpendicular. For example, this command can be used to check that side lines for lots are perpendicular to the frontage polyline. For every non-perpendicular intersection, a temporary graphic arrow is drawn and the angle and the coordinates of the point are reported at the command line.

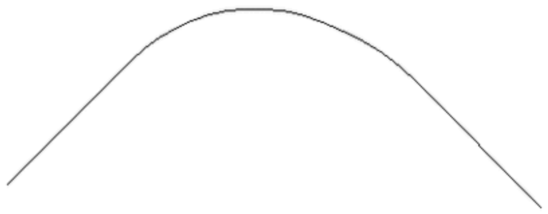
Prompts

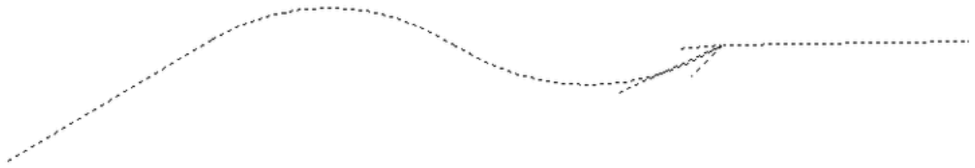
Select the polylines to check.
Select objects: *pick polylines to check*
Warning: Polyline non-perpendicular by 0°00'47" at 5477.08,5047.53

Pulldown Menu Location: Edit > Polyline Utilities > Check Polylines
Keyboard Command: highlight_nonperp
Prerequisite: Polylines

Highlight Non-Tangent Polylines

This command highlights selected polylines that have non-tangent lineworks. For every non-tangent polyline, an arrow is pointed to the first non-tangent point, and the non-tangent angle and the coordinates of the point are reported at the command line.





Prompts

Select polylines to check.
Select objects: 1 found
Select objects: 1 found, 1 total
Select objects: *press Enter to end*
Polyline non-tangent by 32°15'26" at 1540.41,-182.05
Highlighted 1 non-tangent polylines.

Pulldown Menu Location: Edit > Polyline Utilities > Check Polylines
Keyboard Command: highlight_nontangent
Prerequisite: Polylines

Highlight Unclosed Polylines

This tool will evaluate polylines you select and highlight those that are open. It also provides options to close all or selected polylines from those found.

First select all polylines to evaluate. The tool will then display those that are open in a highlighted appearance. You will be offered an option to close all or selected polylines. If you wish to close all the open polylines, choose the All option. If you choose the Selected option you will be prompted to pick which polylines you want to close. As you pick each polyline it will be closed.

Prompts

Select the polylines to check.
Select objects: *pick polylines to process*
Open polylines are highlighted.
Close all or selected polylines [All/<Selected>]? *S*
Pick polyline to close: *press Enter to end or select polylines*

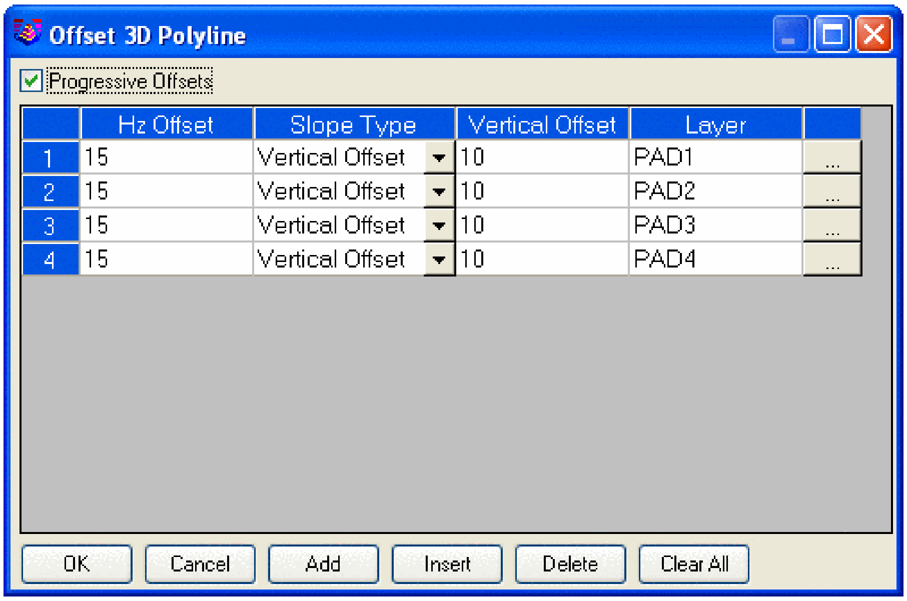
Pulldown Menu Location: Edit > Polyline Utilities
Keyboard Command: unclosed
Prerequisite: A polyline

Offset 3D Polyline

This command allows you to offset a 3D polyline entity in both the horizontal and vertical directions. There are five offset methods. The Interval method applies one horizontal and one vertical offset to all the vertices of the polyline. The Constant method has a horizontal offset and sets the elevation of the polyline to one constant elevation. The Variable method allows you to specify each horizontal and vertical offset individually either by polyline segment or for each point. The vertical offset can be specified by actual vertical distance, percent slope or slope ratio.

The surface method allows to offset/project a 3D polyline entity on to a surface (tin;flt;grd) based on cut and fill outslope ratio.

The multiple method allows multiple offsets of a 3D polyline with separate layers. User can add, insert and delete offsets rows and set individual layers. The option Progressive Offsets draws offsets progressively, i.e. successive offsets uses last drawn offset as base.

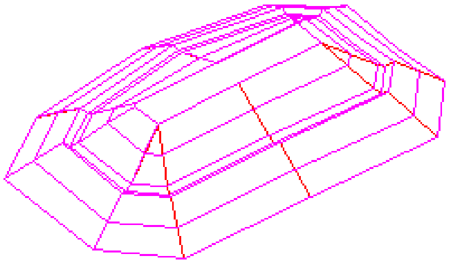


☑ Progressive Offsets

	Hz Offset	Slope Type	Vertical Offset	Layer	
1	15	Vertical Offset	10	PAD1	...
2	15	Vertical Offset	10	PAD2	...
3	15	Vertical Offset	10	PAD3	...
4	15	Vertical Offset	10	PAD4	...

Prompts

Enter the offset method [<Interval>/Constant/Variable/Surface/Multiple]: *press Enter*
Vertical/<Horizontal offset amount>: *15*
Percent/Ratio/Vertical offset amount <0>: *10*
Select a polyline to offset (Enter for none): *select a 3D poly*
Select side to offset: *pick a point*
Select a point on the graphics screen that is in the direction of the side of line to offset.
Select a polyline to offset (Enter for none): *press Enter*



Pulldown Menu Location: Edit > 3D Polyline Utilities

Keyboard Command: offset3d
Prerequisite: Plot the *3DPoly* lines to use for selection.

Fillet 3D Polyline

This command fillets two segments of a 3D polyline with the given radius. The standard *FILLET* command does not support 3D Polyline entities. Since 3D polylines cannot have arcs, this command draws the fillet arc as a series of short chords. The elevations along the curve are interpolated from the 3D polyline.

Prompts

Fillet corner of a polyline or intersection of two polylines [<Corner>/Intersection]? *press Enter*
Enter fillet radius <10.00>: *press Enter*
Select a corner point on polyline: *pick 3D polyline near meeting point of two segments*
Select a corner point on polyline: *pick 3D polyline near meeting point of two segments*
Select a corner point on polyline: *press Enter* (to end command)

Pulldown Menu Location: Edit > 3D Polyline Utilities
Keyboard Command: fillet3d
Prerequisite: 3D polyline

Join 3D Polyline

This command joins *3DPOLY* entities into a single 3D polyline entity.

Prompts

Select the 3D polyline to join: *pick a 3D polyline*
Select the other 3D polyline to join: *pick a 3D polyline that has a common endpoint with the first*
3 segments added to the polyline.

Pulldown Menu Location: Edit > 3D Polyline Utilities
Keyboard Command: join3d
Prerequisite: Plot the *3DPoly* lines to use for selection

Break 3D Polyline by Surface

This command breaks 3D polylines at the intersection with a surface.

Prompts

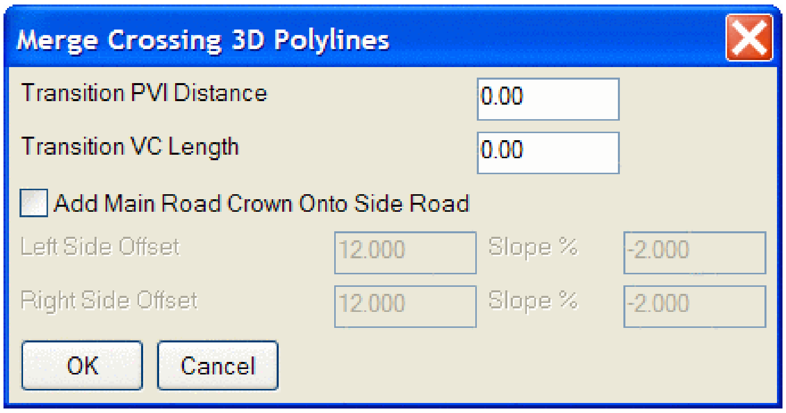
Select Surface
Select polylines to clip.
Select objects: *pick the 3D polylines*
Erase polyline below surface [<Yes>/No]? *press Enter* If you answer yes, the segments of the polylines below the surface will be erased from the intersection, if any, of the polyline with the surface. Otherwise the polylines will only be broken into separate polylines at the intersection.

After Break 3D Polyline by Surface Before Break 3D Polyline by Surface

Keyboard Command: surfbreak
Prerequisite: 3D Polylines to break and a surface.

Merge Crossing 3D Polylines

This command works with 2 crossing 3D polylines, adding one or more vertices to one of them at the virtual point of intersection to match the elevation of the other. The 3D polyline that is vertically unchanged is referred to as the "Main 3D polyline", the 3D polyline that is edited is referred to as the "Side 3D polyline." The command uses the 2 vertices on the Main 3D polyline on either side of the virtual intersection to determine an interpolated elevation on the Main 3D polyline at the point of virtual intersection, and adds a vertex on the Main 3D polyline at that location with the calculated elevation, but the vertical characteristics of the Main 3D polyline are otherwise unchanged. The Side 3D polyline gets a new vertex at the virtual intersection with the same interpolated elevation, thereby changing it's vertical definition as much as necessary to match. The characteristics of the transition are controlled by the settings in the Merge Crossing 3D Polylines dialog box.


Merge Crossing 3D Polylines

Transition PVI Distance: 0.00
Transition VC Length: 0.00
☐ Add Main Road Crown Onto Side Road
Left Side Offset: 12.000 Slope %: -2.000
Right Side Offset: 12.000 Slope %: -2.000

Transition PVI Distance: This option creates 2 additional vertices on the Side 3D polyline, each at the specified distance from the virtual intersection, and both with the same elevation as the vertex at the virtual intersection, essentially creating a flat section.

Transition VC length: This option creates a vertical curve for the transition, passing through the interpolated elevation at the virtual intersection. The start of the vertical curve is the specified value from the virtual intersection, as is the end, so the overall length of the entire vertical curve is actually twice the value specified in the dialog box.

Add Main Road Crown Onto Side Road: This option creates the transition by assuming the Main 3D polyline is a crowned roadway, and creates corresponding additional vertices on the Side 3D polyline.

Prompts

Select the Main 3D polyline: *pick the 3D polyline that will determine the crossing elevation, but will remain essentially unchanged*
Select the Side 3D polyline: *pick the 3D polyline that is be changed to match the Main 3D polyline elevation at the virtual intersection*
Merge Crossing 3D Polylines dialog Adjust variables as desired in Merge Crossing 3D Polylines dialog box, pick

OK.

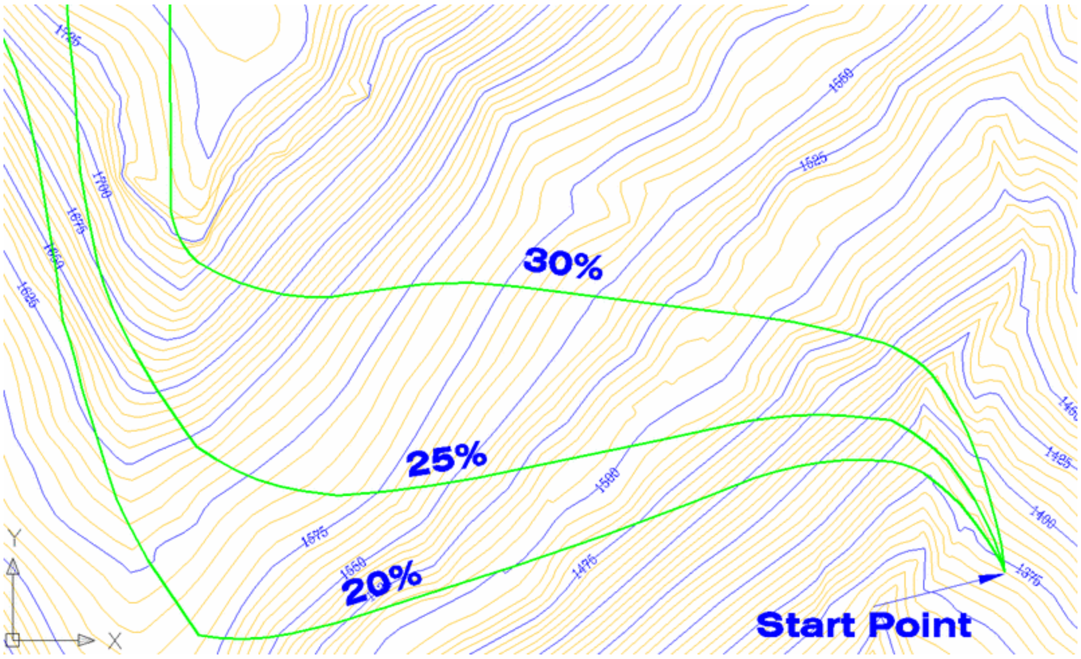
Pulldown Menu Location: 3D Data
Keyboard Command: merge3d
Prerequisite: 2 crossing 3D polylines

3D Polyline by Slope on Surface

This command creates a 3D polyline at a user-specified slope. The user picks the starting point and then the polyline continues along the surface at the slope until it reaches a point where the maximum slope at the point is less than the design slope. The surface is defined by a grid or TIN file which must be created before running this routine. Applications for this command include designing haul roads or ditches.

Prompts

Enter the polyline layer <SLOPE_ROAD>: *press Enter*
Select the Grid File dialog
Reading row> 51
Extrapolate grid to full grid size (Yes/<No>)? *Y*
Limiting length for polyline (Enter for none):
Pick origin point of 3D polyline: *pick a starting point*
Direction of 3D Polyline (<Up>/Down)? *press Enter*The slope must go either uphill or downhill.
Direction of 3D Polyline facing up slope (<Left>/Right)? *R* Imagine facing uphill. Do you want the polyline to go to the left or right?
Enter the design slope: *10* This value is in percent slope.



Pulldown Menu Location: 3D Data
Keyboard Command: surfpl
Prerequisite: Existing surface file

Add Points At Elevation

This command inserts vertices into a 3D Polyline at a specific elevation, or elevation interval, by interpolating between existing elevations in the polyline.

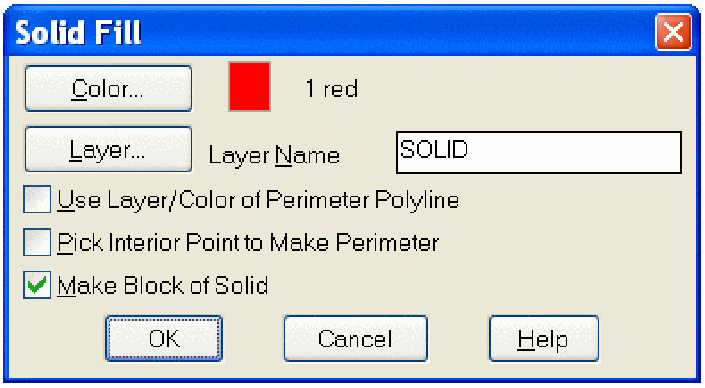
Prompts

Add single elevation or elevation interval [Single/<Interval>]? *press Enter*
Enter Elevation Interval: 50
Select 3D polylines to process. *pick 3D polyline(s)*
Select objects: 1 found
Select objects:
Processing polylines ...
Added 10 points to polylines.

Pulldown Menu Location: Edit > 3D Polyline Utilities
Keyboard Command: addplz
Prerequisite: 3D Polylines

Solid Fill Polyline

This command fills the interior of closed polylines with 3D Faces to make the polyline areas appear solid. Closed polylines for exclusion areas can be used to exclude areas from the fill. Text can also be selected to exclude the text area from the fill. As an alternative, you can use the *HATCH* command, which creates an associative link between the hatch object and its boundary, interior boundary and any text that is excluded.



Solid Fill

Color... 🟥 1 red

Layer... Layer Name SOLID

☐ Use Layer/Color of Perimeter Polyline
☐ Pick Interior Point to Make Perimeter
☑ Make Block of Solid

Prompts

Solid Fill Dialog Box
Use Layer/Color of Perimeter Polyline This option uses the layer and color of the perimeter polyline for the solid fill faces instead of those in the dialog box.
Pick Interior Point to Make Perimeter Instead of requiring a closed perimeter polyline, this option defines the perimeter by the boundary of the area around a picked point.
Make Block of Solid The solid is created by adjoining 3D faces. This option groups the 3D faces into a block.
Select Inclusion perimeter polylines.
Select objects: *pick closed polyline*
Select Exclusion perimeter polylines.
Select objects: *press Enter*

Select Text to Exclude from fill.
Select objects: *press Enter*

Pulldown Menu Location: Edit
Keyboard Command: solidfill
Prerequisite: A closed polyline

3D Entity to 2D

This command changes a 3D Line, Arc, Circle, Polyline, Insert or Point to 2D, i.e. an entity with the elevations of the endpoints at the same Z coordinate. When the program detects a 3D polyline with all vertices with the same elevation, there is an option to convert to a 2D polyline with this elevation. Otherwise, the entered elevation here is used.

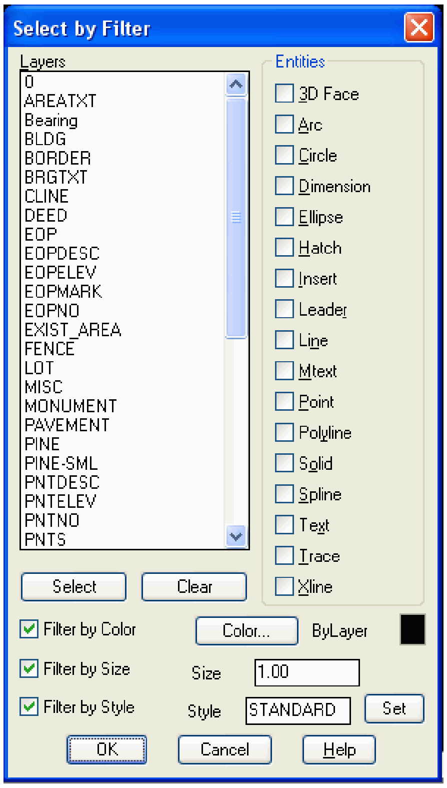
Prompts

Select/<Enter Elevation <0.00>: *press Enter*
Select Lines, Arcs, Circles, Polylines, Inserts and Points for elevation change.
Select objects: *pick a 3D polyline*
3DPOLY to 2DPOLYLINE
Number of entities changed> 1

Pulldown Menu Location: Edit
Keyboard Command: 3dto2d
Prerequisite: None

Select by Filter

This command can be used to build a selection set of objects inside a drawing based on layer and entity type. There is a dialog to define the filters. Select the layer(s) on the left you wish to select, then turn on the toggle(s) for the entity types to consider. There is an option to filter by entity color. Also, the size and style filters can be used for text entities. The program then builds a selection set of those objects that resides on those layers. Then to use this selection set in other commands, enter "P" for previous at the "Select objects:" prompt.



Layers

0
AREATXT
Bearing
BLDG
BORDER
BRGTXT
CLINE
DEED
EOP
EOPDESC
EOPELEV
EOPMARK
EOPNO
EXIST_AREA
FENCE
LOT
MISC
MONUMENT
PAVEMENT
PINE
PINE-SML
PNTDESC
PNTELEV
PNTNO
PNTS

Entities

- ☐ 3D Face
- ☐ Arc
- ☐ Circle
- ☐ Dimension
- ☐ Ellipse
- ☐ Hatch
- ☐ Insert
- ☐ Leader
- ☐ Line
- ☐ Mtext
- ☐ Point
- ☐ Polyline
- ☐ Solid
- ☐ Spline
- ☐ Text
- ☐ Trace
- ☐ Xline

☑ Filter by Color ByLayer ■
☑ Filter by Size Size 1.00
☑ Filter by Style Style STANDARD

Pulldown Menu Location: Edit > Selection Sets
Keyboard Command: fsel
Prerequisite: None

Select by Elevation

This command builds a selection set of entities that are greater than, less than or in between a specified elevation that you enter in on the command line. Entities selected, based upon this elevation criteria, go into a selection set. With the Window selection method, the entities must be entirely inside of the inclusion area to be included in the selection set. With the Crossing selection method, an entity is added to the selection set if any part of the entity is inside the inclusion area.

Prompts

Select by greater, less or between elevations [<Greater>/Less/Between]? *press Enter*
Enter elevation for greater than: *19*
Ignore zero elevations [<Yes>/No]? *press Enter*
Select objects to build selection set. *pick objects*
Processing selection set ...
Built selection of 120 objects for elev more than 19.00.
To use type 'P' at Select objects: prompt.

Pulldown Menu Location: Edit > Selection Sets
Keyboard Command: zselect
Prerequisite: Entities

Select by Length

This command builds a selection set of linework objects in the drawing based on linework length. The length filter can be setup to get linework greater than or less than the specified value, or between two length values. After specifying the length criteria, the program prompts for selecting the linework to check. The program then builds a selection set of those objects that pass the length filter. Then to use this selection set in other commands, enter "P" for previous at the "Select objects:" prompt.

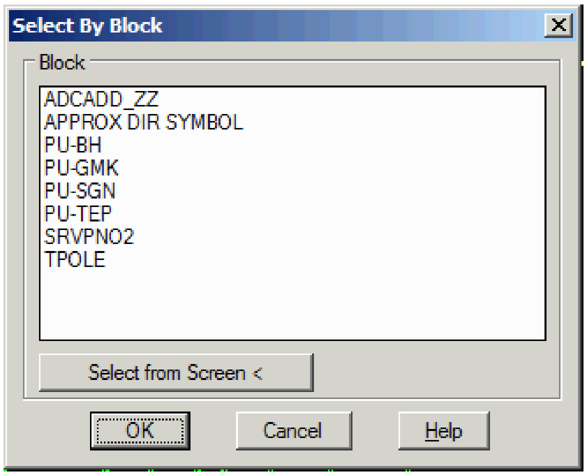
Prompts

Select by greater, less or between lengths [<Greater>/Less/Between]? *press Enter*
Enter length for greater than: *1000*
Select objects to build selection set.
Select objects: *pick linework to filter*

Pulldown Menu Location: Edit > Selection Sets
Keyboard Command: lenselect
Prerequisite: None

Select by Block

This command builds a selection set of blocks by using a block name filter. The block name to match is specified in a dialog with a list of all the block names in the drawing. Either pick from the list or use the Select From Screen button to get the block name by picking a block in the drawing. After selecting the block name, pick OK and the program will report how many of those blocks were found in the drawing and put into the selection set. This selection set is then ready to use at the next command with a select objects prompt. To use the selection set, type 'P' at the select objects prompt.



ADCADD_ZZ
APPROX DIR SYMBOL
PU-BH
PU-GMK
PU-SGN
PU-TEP
SRVPNO2
TPOLE

Pulldown Menu Location: Edit > Selection Sets
Keyboard Command: selblk
Prerequisite: Blocks

Select by Area

This command builds a selection set using inclusion and/or exclusion closed polylines. Entities within the inclusion polylines are selected and entities within the exclusion polylines are not selected. With the Window selection method, the entity must be entirely inside the inclusion area and entirely outside the exclusion area to be included in the selection set. With the Crossing selection method, an entity is added to the selection set if any part of the entity is inside the inclusion area.

Prompts

Select the Inclusion perimeter polylines or ENTER for none:
Select objects: *pick the closed polyline*
Select objects: *press Enter*
Select the Exclusion perimeter polylines or ENTER for none.
Select objects: *press Enter*
Type of selection (Window/<Crossing>)? *press Enter*
Select objects to build selection set.
Select objects: *All* These selected objects are checked with the inclusion/exclusion polylines.
Select objects: *press Enter*
Built selection set with 43 objects.
Command: *Erase*
Select objects: *P* To use previous selection set created by Select by Area.
43 found
Select objects: *press Enter*

Pulldown Menu Location: Edit > Selection Sets
Keyboard Command: ssgetarea
Prerequisite: Closed perimeter polylines

Select Similar

This command creates a selection set of all entities in the drawing with properties that match the selected entity. The properties filter uses the entity type and layer name. To use this selection set in other commands, enter "P" for previous at the "Select objects:" prompt.

Pulldown Menu Location: Edit > Selection Sets
Keyboard Command: selectsim
Prerequisite: None

View Menu

4

Redraw

This command refreshes the display in the current viewport.

Prerequisite: None

Keyboard Command: R

Regen

This command regenerates the drawing and refreshes the current viewport.

Prerequisite: None

Keyboard Command: REGEN

Zoom - Window

This commands zooms to display an area you specify by two opposite corners of a rectangular window.

Prerequisite: None

Keyboard Command: ZOOM, W

Zoom - Dynamic

This command zooms to display the generated portion of the drawing using a view box. The view box represents your viewport, which you can shrink or enlarge and move around the drawing. Positioning and sizing the view box pans or zooms the viewport, filling it with the image inside the view box.

Prerequisite: None

Keyboard Command: ZOOM, D

Zoom - Previous

This command zooms to display a previous view. You can restore up to 10 previous views.

Prerequisite: None

Keyboard Command: ZOOM, P

Zoom - Center

This command zooms to display a window you define by picking a center point and a magnification value or height. A smaller value for the height increases the magnification. A larger value decreases the magnification.

Prompts

1 Specify center point: **pick a point**

2 Enter magnification or height <226.66>: **enter a value**

Prerequisite: None

Keyboard Command: ZOOM, C

Zoom - Extents

This command zooms to display the drawing extents. You can use Zoom Extents transparently, but it always regenerates the drawing.

Prerequisite: None

Keyboard Command: ZOOM, E

Zoom In

This command increases the zoom factor of the current viewport by a factor of 2.0.

Prerequisite: None

Keyboard Command: ZOOM, 2.0x

Zoom Out

This command decreases the zoom factor of the current viewport by a factor of 0.5.

Prerequisite: None

Keyboard Command: ZOOM, 0.5x

Zoom Points

This command centers the screen to a user-specified point. The point can be specified by either the point number or description. The command searches the current coordinate (.CRD) file. Besides centering the screen, the magnification can also be changed. The default value is the current magnification. To zoom in, enter a smaller value and to zoom out, enter a greater value.

Prompts

Find by point number or description [<Number>/Desc]? *N*
Point number or range of point numbers to find <1>: 2079
We want to find point number 2079
Magnification or Height <179.50>: *press Enter*

Accept the default zoom magnification

Pulldown Menu Location: View
Keyboard Command: zoompnt
Prerequisite: A .CRD file

Thaw/On All Layers

This command turns on and thaws all layers in the drawing.

Pulldown Menu Location: View
Keyboard Command: loa
Prerequisite: None

Lock Layers

The *Lock Layers* command will lock the layers for the layers of the selected entities.

The *Unlock Layers* command will unlock the layers for the layers of the selected entities.

Pulldown Menu Location: View
Keyboard Command: laylock, layunlock
Prerequisite: None

Pan

This command moves the drawing display in the current viewport. The cursor changes to a hand cursor. By holding down the pick button on the pointing device, you lock the cursor to its current location relative to the viewport coordinate system. The drawing display is moved in the same direction as the cursor.

hand cursor

When you reach a logical extent (the edge of the drawing space), a bar is displayed on the hand cursor on the side where the extent has been reached. Depending on whether the logical extent is at the top, bottom, or side of the drawing, the bar is either horizontal (top or bottom) or vertical (left or right side).

top
extent

right
extent

bottom
extent

left
extent

When you release the pick button, panning stops. You can release the pick button, move the cursor to another location in the drawing, and then press the pick button again to pan the display from that location.

To stop panning at any time, press Enter or ESC.

Prerequisite: None

Keyboard Command: P

Twist Screen Standard

This command allows you to "twist" the screen's orientation so that a direction other than North is toward the top of the screen and the drawing. It does not do a coordinate rotation, and it leaves the database unchanged. The ROTATE and MOVE commands in the Edit menu can be used to do a coordinate rotation and translation.

This command prompts you for the twist angle, then adjusts the screen and crosshairs to that angle. The twist angle is always measured counterclockwise, with 0 degrees at the east/right.

Prerequisite: None

Keyboard Command: TWIST1

Twist Screen Line

This command is a variation of Twist Screen Standard. The command aligns a selected line, polyline or text to be parallel to the east-west direction of your graphics screen.

Think of what you select as a pointer or arrow that will be moved to point in the east direction of the screen. Select the line, polyline or text closest to the endpoint that you want it to point in the horizontal or east direction of the screen.

Prerequisite: None

Keyboard Command: TWIST2

Twist Screen Surveyor

This command is another variation of Twist Screen Standard. You enter the angle/azimuth that you want to be aligned parallel to the east-west direction of the graphics screen.

Prerequisite: None

Keyboard Command: TWIST3

Restore Due North

This command twists the screen to make due north vertical.

Pulldown Menu Location: View > Twist Screen
Keyboard Command: twist4
Prerequisite: None

Twist To 3D View

This command orients selected text, symbols and point attributes to face the current viewpoint. Typically, text and points are drawn to face up to plan view. When viewed in 3D from the side, this text can be hard to read. This command makes this text readable for the current view. Before running this command, the 3D view should be set by commands like Viewpoint 3D or Orbit. The entities are oriented to the current view by setting the extrusion values for the entities.

Prompts

Select points, symbols and text to twist.
Select objects: *pick entities*

Pulldown Menu Location: View > Twist 3D Entities
Keyboard Command: twist3d
Prerequisite: Entities to view

Restore World View

This command is the companion to the Twist To 3D View command. This command resets entities so that they face up in plan view.

Prompts

Select points, symbols and text to restore.
Select objects: *pick entities*

Pulldown Menu Location: View
Keyboard Command: untwist3d
Prerequisite: 3D Entities

Display Order

This command allows you to change the display order of objects by repositioning an entity from either the background to the forefront of the drawing view or from the forefront to the background of the drawing view.

Prerequisite: None

Keyboard Command: draworder

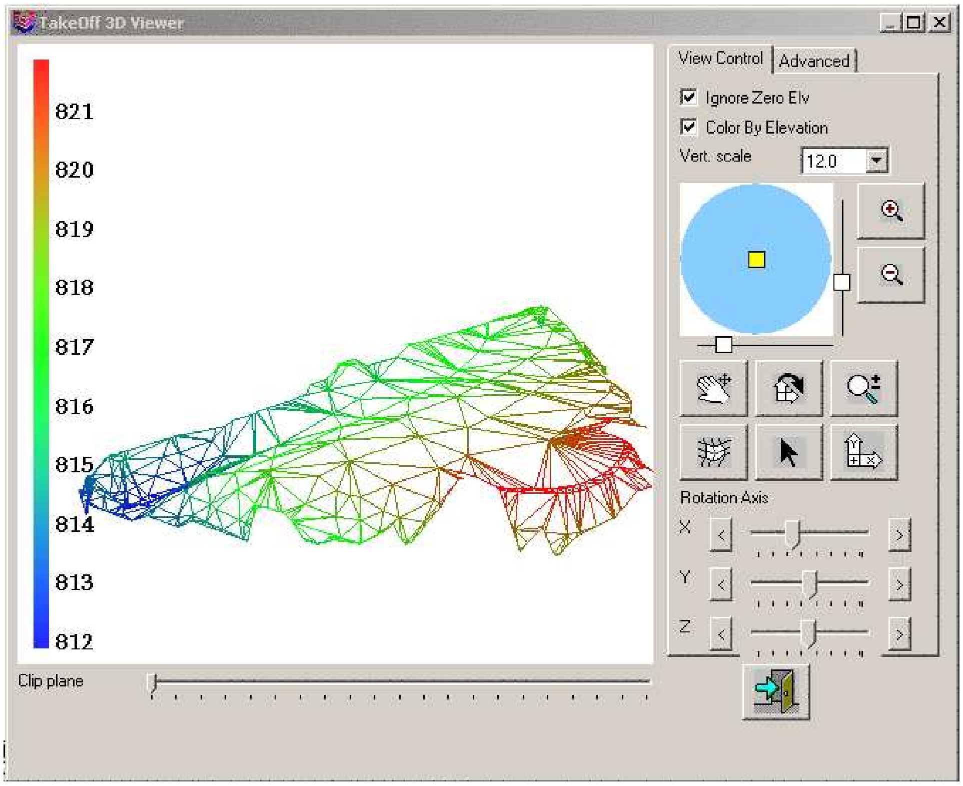
Update Colors For Set Elevations

This command refreshes the color of entities depending on their elevation and layer target. For entities assigned to the Existing or Design layer targets, if the entities are at zero elevation then their color is set to grey. Otherwise the entities have their true, original color. If the Automatic Update Colors command under Settings->Configure->Takeoff Module is toggled off, then this command is the way to update the entity colors after editing elevations.

Prerequisites: none
Keyboard Command: update_tk_colors

Existing Surface 3D Viewer

This command allows you to view the existing surface in 3D mode.



☑ Ignore Zero Elv
☑ Color By Elevation
Vert. scale 12.0

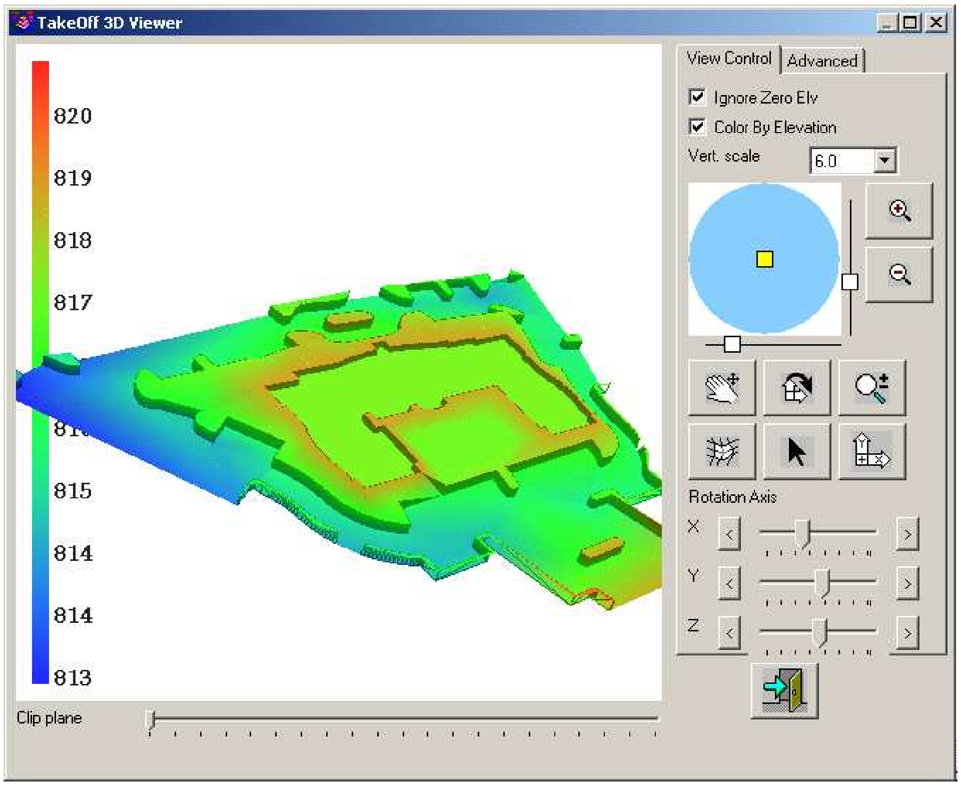
In the top right of the control bar you can check to Ignore Zero Elev and Color By Elevation and change the Vertical Scale. If you increase the Vertical Scale than elevation differences can be seen easier. Ignore Zero Elev does not display elevations of zero in the 3D viewer. Color By Elevation shows elevation change with the change of colors. Note: Color By Elevation is used in the above example. To adjust the color use the color circle on the right.

The magnify glass icons can be used to zoom in and out. Click on the plus magnify glass to zoom in and the minus magnify glass to zoom out. With the icon click and drag up to zoom in and drag down to zoom out.The hand icon below the color circle allows you to pan around the viewer. Click and drag the direction you want to move. The icon can be used to rotate the vantage point of the viewer by the x, y, or z axis. When you move the cursor to the screen it will change into a x, y symbol or a z symbol. Move the cursor around to move it from one to the other. If you have the x, y cursor move right or left to change the x axis view, or to change the y move the cursor up or down. If you have the z cursor than move it in a circular fashion to rotate the view point according to the z axis. The icon toggles on and off the shading of the surface. The arrow icon reports the elevations at the bottom of the screen as you move around the surface. The icon restores the surface viewpoint to flat. The icon exits 3D Driver Simulation.

Rotation Axis: These three control bars rotate the surface around the x, y, and z axis. Clip plane trims the size of the surface shown in the viewer.
Prerequisite: an existing surface
Keyboard Command: cube_exist

Design Surface 3D Viewer

This command allows you to view the design surface in 3D mode.



TakeOff 3D Viewer

☑ Ignore Zero Elv
☑ Color By Elevation
Vert. scale 6.0

In the top right of the control bar you can check to Ignore Zero Elev and Color By Elevation and change the Vertical Scale. If you increase the Vertical Scale than elevation differences can be seen easier. Ignore Zero Elev does not display elevations of zero in the 3D viewer. Color By Elevation shows elevation change with the change of colors. Note: Color By Elevation is used in the above example. To adjust the color use the color circle on the right.

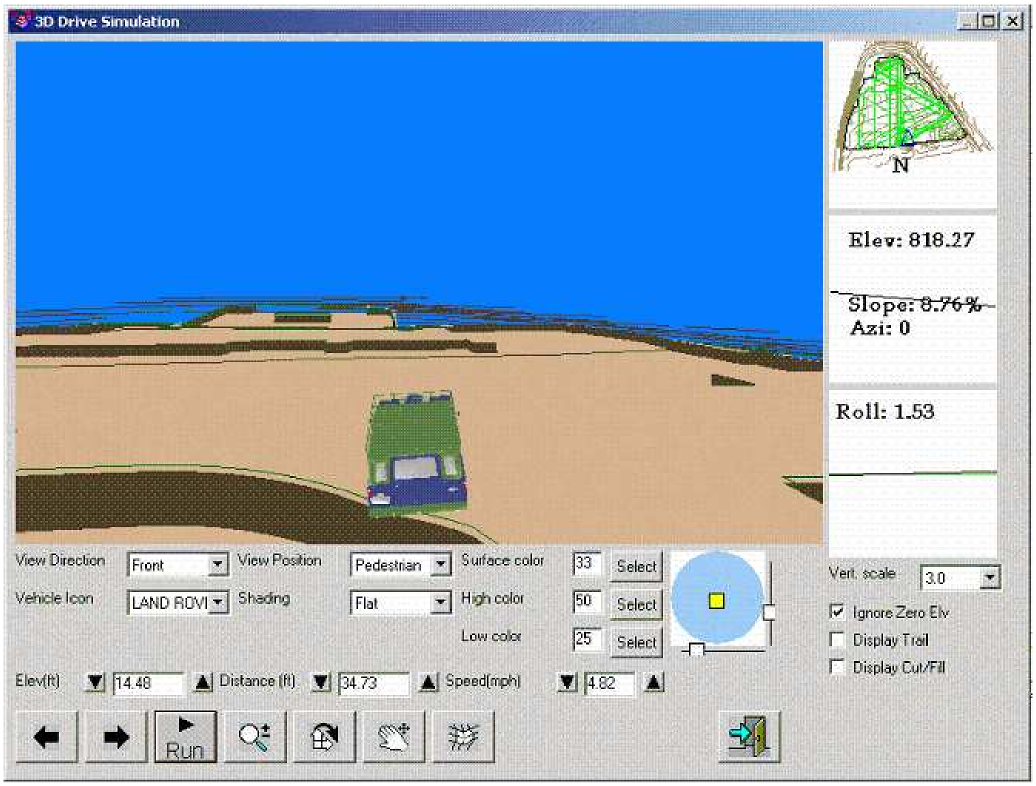
The magnify glass icons can be used to zoom in and out. Click on the plus magnify glass to zoom in and the minus magnify glass to zoom out. With the icon click and drag up to zoom in and drag down to zoom out. The hand icon below the color circle allows you to pan around the viewer. Click and drag the direction you want to move. The icon can be used to rotate the vantage point of the viewer by the x, y, or z axis. When you move the cursor to the screen it will change into a x, y symbol or a z symbol. Move the cursor around to move it from one to the other. If you have the x, y cursor move right or left to change the x axis view, or to change the y move the cursor up or down. If you have the z cursor than move it in a circular fashion to rotate the view point according to the z axis. The icon toggles on and off the shading of the surface (the shading is shown in the above drawing). The arrow icon reports the elevations at the bottom of the screen as you move around the surface. The icon restores the surface viewpoint to flat. The icon exits 3D Driver Simulation.

Rotation Axis: These three control bars rotate the surface around the x, y, and z axis. Clip plane trims the size of the surface shown in the viewer.

Prerequisite: a design surface
Keyboard Command: cube_design

3D Drive Simulation

This command allows you to view and move around the design surface in 3D mode.



3D Drive Simulation

Elev: 818.27
Slope: 8.76%
Azi: 0
Roll: 1.53

View Direction: Front
View Position: Pedestrian
Surface color: 33
Vehicle Icon: LAND ROVI
Shading: Flat
High color: 50
Low color: 25
Vert. scale: 3.0
☑ Ignore Zero Elv
☐ Display Trail
☐ Display Cut/Fill
Elev(ft): 14.48
Distance (ft): 34.73
Speed(mph): 4.82

Use the arrows on your keypad to move around the drawing.

At the very bottom of the window you will find the basic commands: Run will start to drive your vehicle around the surface, once your vehicle is moving the Run button turns into the Stop button. The arrows moves your vehicle left and right. The magnify glass zooms in and out. Click and drag up to zoom in and click and drag down to zoom out. When your vehicle is stopped the icon can be used to rotate the vantage point of the viewer by the x, y, or z axis. When you move the cursor to the screen it will change into a x, y symbol or a z symbol. Move the cursor around to move it from one to the other. If you have the x, y cursor move right or left to change the x axis view, or to change the y move the cursor up or down. If you have the z cursor than move it in a circular fashion to rotate the view point according to the z axis.

The hand icon allows you to pan around the viewer. Click and drag the direction you want to move. The icon toggles the shading of the surfaces. The icon exits 3D Driver Simulation.

Above the basic command buttons you can change the Elevation and Distance away from your vehicle. Also, you can set the speed at which your vehicle travels. For a smaller drawing you may want to move around slower, for a larger drawing faster. Note: Unrealistic speeds such as 500 mph in a dozer may cause 3D Drive Simulation to freeze.

View Direction: Sets the direction of the view from the Front, Back, Left, or Right.
Vehicle Icon: You can select which Vehicle you want to use whether: Dozer, Hummer, School Bus or none at all.
View Position: Sets the elevation and distance to either that of the driver, a pedestrian, or bird.
Shading: Here you can set the shading of the surface to either Flat, Smooth, Elevation, Cut/Fill, or none. Flat just shades the contours as the are. Smooth smooths contours to look for realistic. Elevation colors different elevations in different colors so differences can visual be seen. Cut/Fill colors areas of cut differently than areas of fill so they can be visually seen. None merely shows the triangulation.and does not shade in a surface.
You can select the Surface, High, and Low color by enter in an AutoCAD defined color number or you can choose Select to pick a color. The circle on the right determines the shade of the color.

In the top right of the 3D viewer is an aerial map of your surface. Below that the Elevation, Slope percentage, Azimuth, and Roll are updated as your vehicle moves around the surface. Slope and Roll are shown visually here as well.

On the bottom right you can set the Vertical Scale and check to Ignore Zero Elev, Display Trail, and Display Cut/Fill. If you increase the Vertical Scale than elevation differences can be seen easier. Ignore Zero Elev does not display elevations of zero in the 3D viewer. Display Trail draws a line where your vehicle has driven. Display Cut/Fill displays the cut and the fill.

Prerequisite: a design surface
Keyboard Command: tk_flyby

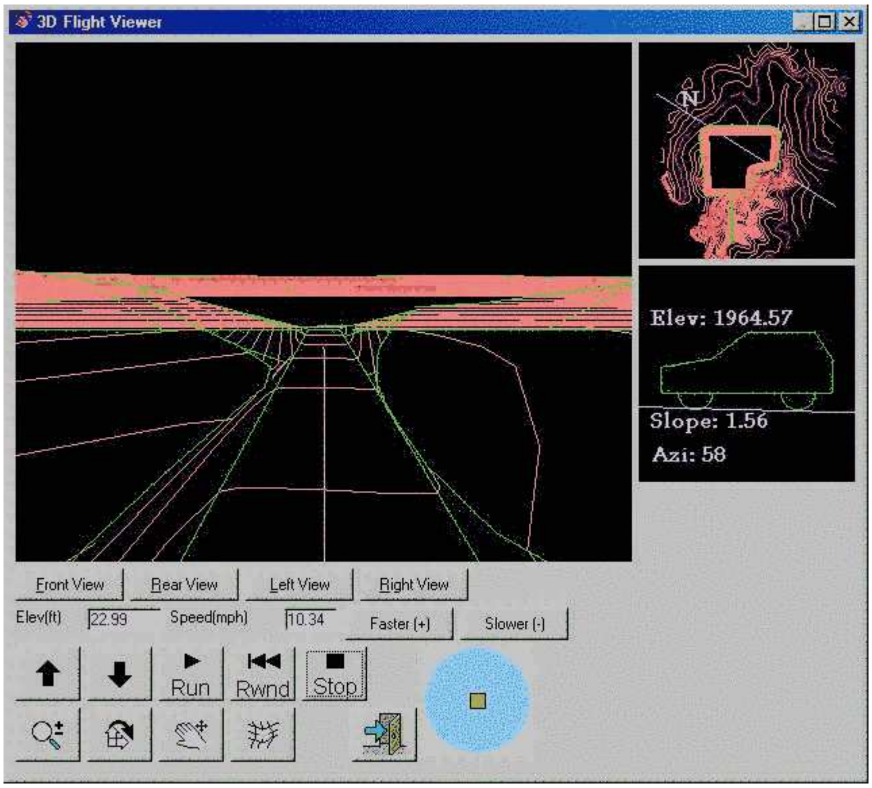
FlyOver Along 3D Polyline

This command allows you to view a self guided animation of following a path through a 3D surface model. There are two variations to this command. When the command is started, you must specify whether you want to use a surface model from file or screen entities.

Surface model from file: Using this method, you can select either a triangulation (.TIN) file or a grid (.GRD) file, then you have the option of following a polyline or following a "free" path. If you choose the polyline method, then the animation is limited to following the polyline. If you choose the "free" path method, you first specify two points to obtain a starting direction, the while inside the viewer you can point the animation in any direction.

Screen entities: Using this method, you must select a 3D polyline to follow. The animation is limited to following the polyline.

After making the above selections, the 3D graphics window is opened. The main window is for the animation, the smaller upper right window shows you the overall plan view, and the smaller window located at middle right shows you the current elevation, slope and azimuth. While following a "free" path, you will have a 3rd small window located at lower right which shows you the amount of roll at your current position.



Elev: 1964.57
Slope: 1.56
Azi: 58

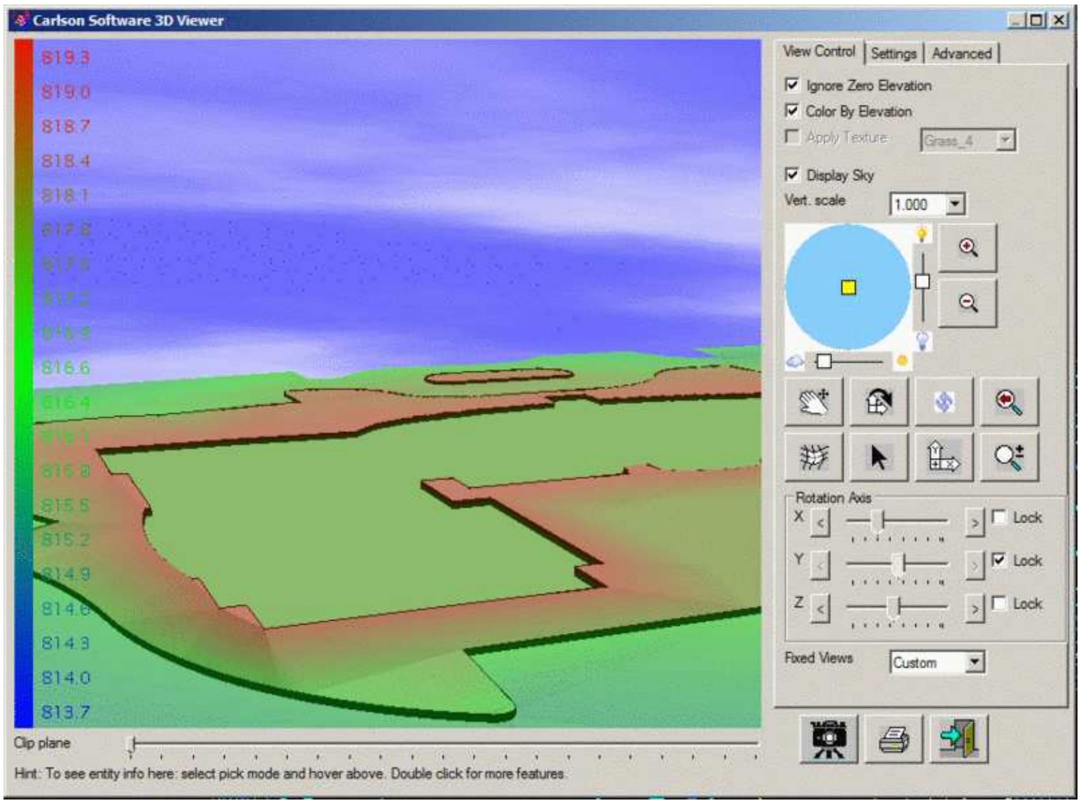
Elev(ft) 22.99
Speed(mph) 10.34

⬆ This button raises the elevation of your viewing position. ⬇ This button lowers the elevation of your viewing position. ⬅ This button turns your viewing position to the left. ➡ This button turns your viewing position to the right. This button allows you to zoom in and out. This button allows you to rotate the main animation window in any X, Y or Z direction. This button allows you to pan. This button toggles shading on and off. ▶ Run This button starts the animation in the main window. ■ Stop This button stops the animation. This button exits the 3D Surface FlyOver command ● Control for position of the light source, viewed from above.

Prerequisite: Surface Model and optionally a 3D Polyline
Keyboard Command: flyby

3D Viewer Window

This command views in 3D, the selected 3D faces, blocks, polylines, lines and points. This routine uses the OpenGL graphics library for rendering, which gives it superior performance. Some of its features include the ability to zoom in and out, pan, rotate around the X,Y,Z axis and shade in user-positioned lighting. Press the right mouse button and drag to zoom the display.


Carlson Software 3D Viewer
819.3
819.0
818.7
818.4
818.1
817.8
817.5
817.2
816.9
816.6
816.4
816.1
815.8
815.5
815.2
814.9
814.6
814.3
814.0
813.7
View Control
Settings
Advanced
Rotation Axis
X
Y
Z

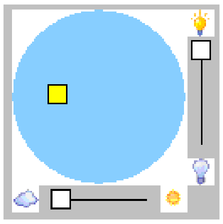
☑ Ignore Zero Elevation
☑ Color By Elevation
☐ Apply Texture Grass_4
☑ Display Sky
Vert. scale 1.000
X ☐ Lock
Y ☑ Lock
Z ☐ Lock
Fixed Views Custom
Clip plane

Hint: To see entity info here: select pick mode and hover above. Double click for more features.

View Control

- **Ignore Zero Elevations:** When checked, the 3D viewer ignore entities at zero elevation.
- **Color By Elevation:** This will color the contours or 3D faces by elevation. The elevation scale legend is displayed on the left of the window.
- **Apply Texture:** Uses a texture pattern for shading surfaces.
- **Display Sky:** Creates a sky dome of 3D faces around the site that is colored blue with some clouds. In order to see the sky, your view point must be below the sky dome. This feature is only available when the software-only graphics mode is turned off under Carlson Configure->General Settings.

- **Vert. scale:** Sets the vertical scale factor for the 3D viewer. Relatively flat surfaces can be exaggerated by increasing the vertical scale.



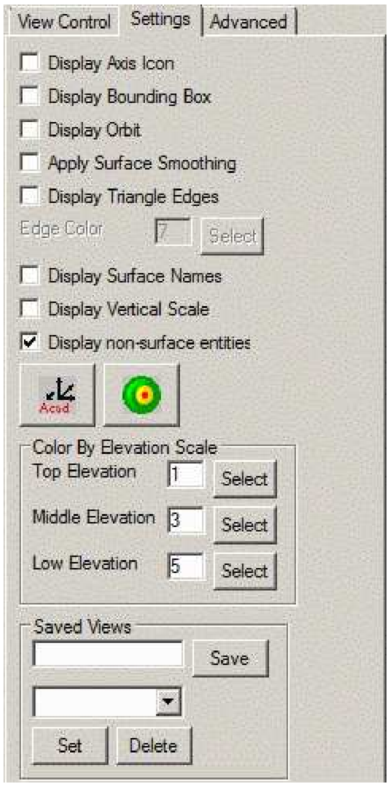
This control represents position of the sun in the sky if looked from above. Therefore, the position of the sun in the center means that the sun is in a zenith, and position near the edge of the circle means that the sun is near the horizon. To move the sun, simply drag it to a new location, or click on the new location. The slide bars on the sides are the intensity and brightness of the display.

Zooms IN. Zooms OUT. Switch to Dynamic Zoom mode. Zoom Previous.

Switch to Pan mode. Click and drag to pan. Switch to Rotation mode. Switch to initial view. Toggles shading on and off. This is an inquire tool. Point the arrow to any entity to display entity data including the layer, type, elevation and length. Resets the 3D view to plan. This function outputs the image to a report. The report format (PDF or DWF) is specified Settings->Configure->General Settings. This function exports the graphic display to an image file. Several different image file formats are supported including bmp, png, jpg, xpm and gif. There is a Export Image Selections dialog to choose the image resolution and color depth. Exit the 3D viewer window.

- **Clip Plane:** This slider will clip the image based on the location of the slider. When the slider is all the way to the left, the entire image is displayed. Moving the slider to the right will clip the image, going deeper as the slider is moved to the right. This is useful to view items that are hidden behind something else.
- **Scroll Bars:** Use X,Y,Z scrollbars near the bottom to rotate the view. The range of these scrollbars is -180 to +180 degrees with middle being 0 which is the default position when the viewer starts. When the cursor is near the middle of the window, the XY icon will allow for rotating the image with the mouse, while holding the left mouse button. Move the cursor to the edge, and the icon switches to Z. This allows for rotating around the Z axis with the mouse, while holding the left mouse button. The Lock toggles hold the axis rotation fixed both for the scroll bar and when dragging with the mouse in the viewer.

- **Fixed Views:** This selection list sets a pre-defined view. Plan View sets the view to look straight down. The other views look from a low angle from the NE, SE, SW or NW.



☐ Display Axis Icon
☐ Display Bounding Box
☐ Display Orbit
☐ Apply Surface Smoothing
☐ Display Triangle Edges
Edge Color 7
☐ Display Surface Names
☐ Display Vertical Scale
☑ Display non-surface entities

Color By Elevation Scale
Top Elevation 1
Middle Elevation 3
Low Elevation 5

Saved Views

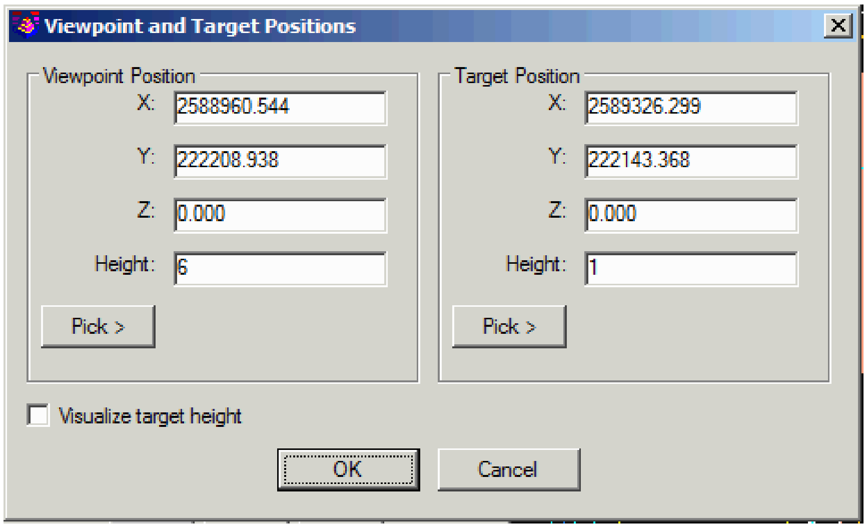
Settings Tab

- **Display Axis Icon:** This controls whether to show the X/Y/Z axis icon in the lower left of the graphic window.
- **Display Bounding Box:** This controls whether to display a 3D box around the limits of the data.
- **Display Orbit:** Shows a graphic guide in the viewer for controlling the view angle and position using the mouse movements similar to the AutoCAD Orbit routine.
- **Apply Surface Smoothing:** This option controls the shading of 3D faces either flat by the normals of each 3D faces or smoothed by transitioning with neighboring 3D faces.
- **Display Triangle Edges:** Shows the edge lines for triangles for visualizing the triangles that make up a surface. When active, there is a setting to control the color for these edges.

- **Display Surface Names:** Shows the file names in the viewer for the surfaces currently being viewed.

- **Display Vertical Scale:** This controls whether to display the current vertical scale in the graphic window.
- **Display Non-Surface Entities:** This controls whether to display entities that have been tagged as "non-surface" by the Tag Non-Surface Entities or Points commands.

Sets the drawing view to match the view shown in the 3D viewer window. This button sets the view position and target position by coordinates. The positions can be entered in the edit boxes or use the Pick button to pick a point in the drawing. The program will pick up the height of the surface for picked points and then the height above the position can be entered. For example to check sight distance, the view position could be a point on a road and height could be the driver eye height and the target position and height could be the object to check.



Viewpoint and Target Positions

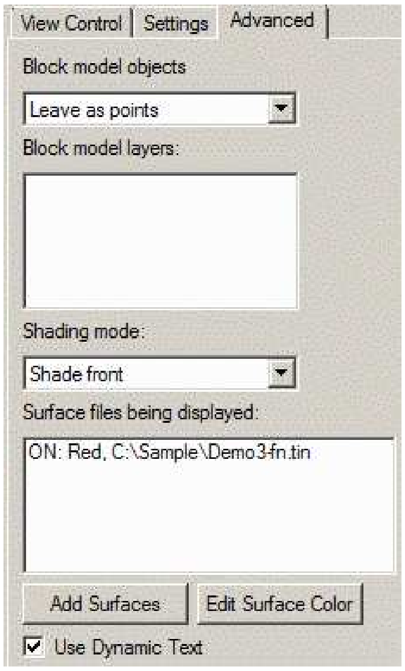
Viewpoint Position
X: 2588960.544
Y: 222208.938
Z: 0.000
Height: 6

Target Position
X: 2589326.299
Y: 222143.368
Z: 0.000
Height: 1

☐ Visualize target height

- **Color By Elevation Scale:** These three colors are used for the Color By Elevation option. The program will interpolate between these colors for the color scale.

- **Saved Views:** This option allows for naming and saving a 3D view. These can be selected from the pulldown. They can be deleted from the list.



Block model objects
Leave as points

Block model layers:

Shading mode:
Shade front

Surface files being displayed:
ON: Red, C:\Sample\Demo3-fn.tin

☑ Use Dynamic Text

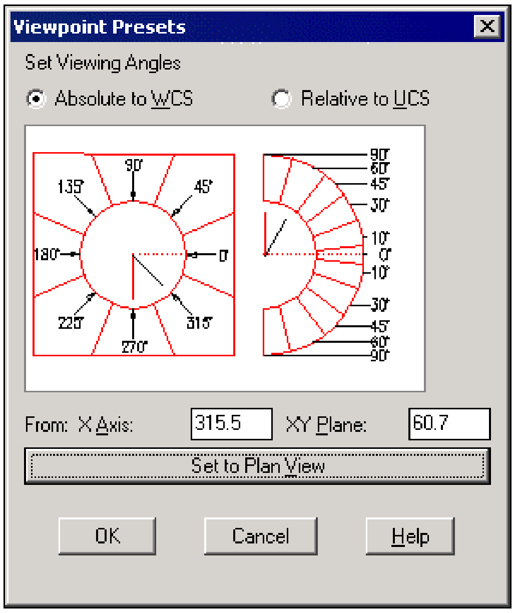
Advanced Tab

- **Block Model Objects:** This option has three choices when loading block model entities. 1. To leave as points. 2. To Render and 3. To prompt each time. If render is selected, it will apply to all face objects such as a TIN or GRD.
- **Block Model layers:** This will display the block color scheme. Colors of the blocks can be turned on or off to view blocks in the middle.
- **Shading Mode:** There are 3 shading modes to render 3D faces. They are 1. Shade Front, 2. Shade Both, and 3. Shade Back. This will render the top and bottom of the faces if desired.
- **Surface Files Being Displayed:** This list controls showing multiple surfaces in the viewer. The Add Surfaces function allows adding grid or triangulation surfaces to the viewer. Double-clicking on a surface name in the list toggles on/off whether that surface is displayed. The Edit Surface Color button changes the color of a surface.
- **Use Dynamic Text:** This controls whether text objects resize based on the current zoom level or stay the fixed size according to their text size in the drawing.

Pulldown Menu Location: View
Keyboard Command: cube
Prerequisite: Entities to display

Viewpoint 3D

This command allows you to define 3D view settings.



Viewpoint Presets

Set Viewing Angles

● Absolute to WCS ○ Relative to UCS

From: X Axis: 315.5 XY Plane: 60.7

1 Under Set Viewing Angles, you must set the direction of the view relative to either the world coordinate system (WCS) or a user coordinate system (UCS).

- **Absolute to WCS**: This option sets the view direction relative to the WCS.
- **Relative to UCS**: This option sets the view direction relative to the current UCS.

2 You must specify the viewing angles.

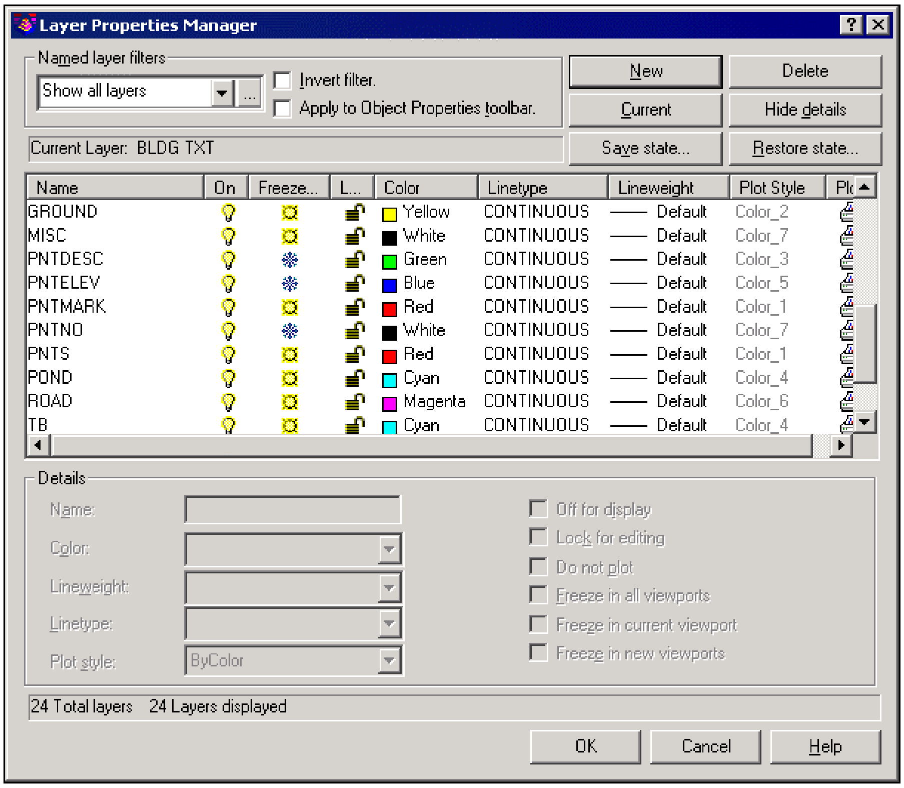
- **X Axis**: This field specifies the angle from the X axis.
- **XY Plane**: This field specifies the angle from the XY plane. You can also use the sample image to specify viewing angles. The black arm indicates the new angle. The red arm indicates the current angle. Specify an angle by selecting the inner region of the circle or half-circle. Selecting the bounded outer regions rounds off the angle to the value displayed in that region.
- **Set to Plan View**: This option sets the viewing angles to display the plan view relative to the selected coordinate system.

Prerequisite: None.

Keyboard Command: DDVPOINT

Layer Control

This command allows you to manage layers and layer properties.



Named layer filters: Show all layers

☐ Invert filter.

☐ Apply to Object Properties toolbar.

Current Layer: BLDG TXT

Name	On	Freeze...	L...	Color	Linetype	Lineweight	Plot Style	Pl
GROUND	💡	☼	🔓	🟨 Yellow	CONTINUOUS	—— Default	Color_2	🖨
MISC	💡	☼	🔓	⬛ White	CONTINUOUS	—— Default	Color_7	🖨
PNTDESC	💡	❄	🔓	🟩 Green	CONTINUOUS	—— Default	Color_3	🖨
PNTELEV	💡	❄	🔓	🟦 Blue	CONTINUOUS	—— Default	Color_5	🖨
PNTMARK	💡	☼	🔓	🟥 Red	CONTINUOUS	—— Default	Color_1	🖨
PNTNO	💡	❄	🔓	⬛ White	CONTINUOUS	—— Default	Color_7	🖨
PNTS	💡	☼	🔓	🟥 Red	CONTINUOUS	—— Default	Color_1	🖨
POND	💡	☼	🔓	🟦 Cyan	CONTINUOUS	—— Default	Color_4	🖨
ROAD	💡	☼	🔓	🟪 Magenta	CONTINUOUS	—— Default	Color_6	🖨
TB	💡	☼	🔓	🟦 Cyan	CONTINUOUS	—— Default	Color_4	🖨

Name:

Color:

Lineweight:

Linetype:

Plot style: ByColor

☐ Off for display

☐ Lock for editing

☐ Do not plot

☐ Freeze in all viewports

☐ Freeze in current viewport

☐ Freeze in new viewports

24 Total layers 24 Layers displayed

This Layer Properties Manager dialog box makes a layer current, adds new layers to the layer name list, and renames an existing layer. You can assign properties to layers, turn layers on and off, freeze and thaw layers globally or by viewport, lock and unlock layers, set plot styles for layers, and turn plotting on and off for layers. You can filter the layer names displayed in the Layer Properties Manager, and you can save and restore layer states and properties settings.

1 Under Named Layer Filters, you determine which layers to display in the list of layers. You can filter layers based on whether they're xref-dependent, or whether they contain objects. You can also filter layers based on name, visibility, color, linetype, lineweight, plot style name, whether they are plotted, or whether they are frozen in the current viewport or in new viewports.

- **[...]**: This button displays the Named Layer Filters dialog box.
- **Invert Filter**: This option displays layers based on the opposites of the criteria you select when you are using a named layer filter. Layers that fit the inverse criteria are displayed in the layer name list.
- **Apply to Object Properties Toolbar**: This option displays in the Object Properties toolbar only layers that match the current filter. The layer list tooltip on the Object Properties toolbar displays the filter status of layers in the drawing. (To display the layer list tooltip, position the pointing device over the layer list on the Object Properties toolbar.)
- **New**: This option creates a new layer. After you choose New, the list displays a layer named LAYER1. You can edit this layer immediately. To create multiple layers quickly, you can select a layer name for editing and enter multiple layer names separated by commas. If you create a new layer, the new layer inherits the properties of the currently selected layer in the layer list (such as Color, and On/Off state). To create layers with default settings, make sure that there are no selected layers in the list or that you select a layer with default settings before beginning layer creation.
- **Current**: This option sets the selected layer as the current layer. The CLAYER system variable stores the layer name.
- **Delete**: This option deletes selected layers from the drawing file definition. You can delete only unreferenced layers. Referenced layers include layers 0 and DEFPOINTS, layers containing objects (including objects in block definitions), the current layer, and xref-dependent layers. Layers that don't contain objects (including objects in block definitions), are not current, and are not xref-dependent can be deleted by using the PURGE command. Be

careful about deleting layers if you are working on a drawing in a shared project or one based on a set of layering standards.

- **Show/Hide Details**: This option controls whether the Details section is displayed in the Layer Properties Manager.

- **Save State**: This option displays the Save Layer States dialog box, in which you save layer state and layer properties settings of all layers in a drawing. You can choose which layer states and properties you want to preserve. You save a layer state by assigning it a name.

- **Restore State**: This option displays the Layer States Manager, in which you can manage named layer states.

2 The Layer Properties Manager dialog box displays all layers and their properties. To modify a property, click its icon. To quickly select all layers, right-click your pointing device and use the shortcut menu. The following are the layer properties you can modify:

- **Name**: This field displays the names of the layers. You can select a name, and then click and enter a new name.

- **On/Off**: This field turns layers on and off. When a layer is on, it is visible and available for plotting. When a layer is off, it is invisible and not plotted, even if Plot is on.

- **Freeze/Thaw in All Viewports**: This field freezes and thaws layers in all floating viewports. A frozen layer is invisible and excluded from regeneration, hiding objects, rendering, and plotting. A thawed layer is visible and available for regeneration, hiding objects, rendering, and plotting.

You can freeze layers to speed up ZOOM, PAN, and many other operations, improve object selection performance, and reduce regeneration time for complex drawings. TakeOff does not display, plot, or regenerate objects on frozen layers. Objects on frozen layers do not hide objects and are not rendered.

You can freeze layers in all viewports, in the current viewport, or in new viewports.

Freeze layers that you want to be invisible for long periods. When you thaw a frozen layer, the program regenerates and displays the objects on that layer. If you switch between visible and invisible states frequently, use the On/Off setting.

- **Lock/Unlock**: This field locks and unlocks the layers. You cannot select or edit objects on a locked layer. Locking a layer is useful if you want to view information on a layer for reference but do not want to edit objects on that layer.

- **Color**: This field changes the color associated with the selected layers. Clicking the color name displays the Select Color dialog box.

- **Linetype**: This field changes the linetype associated with the selected layers. Clicking any linetype name displays the Select Linetype dialog box.

- **Lineweight**: This field changes the lineweight associated with the selected layers. Clicking any lineweight name displays the Lineweight dialog box.

- **Plot Style**: This field changes the plot style associated with the selected layers. If you are working with color-dependent plot styles (the PSTYLEPOLICY system variable is set to 1), you cannot change the plot style associated with a layer. Clicking any plot style displays the Select Plot Style dialog box.

- **Plot/Don't Plot**: This field controls whether the selected layers are plotted. If you turn off plotting for a layer, the objects on that layer are still displayed. Turning off plotting for a layer affects only visible layers in the drawing (layers that are on and thawed). If a layer is set to plot, but is currently frozen or off in the drawing, TakeOff does not plot the layer. Turning off plotting for layers containing reference information such as construction lines can be useful.

Prerequisite: None

Keyboard Command: LAYER

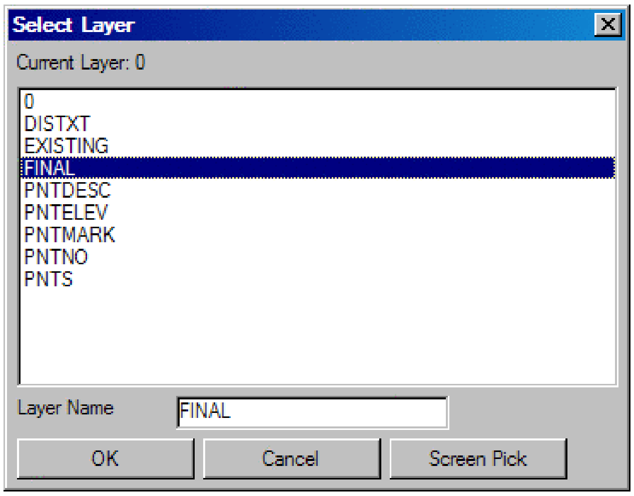
Set Layer

This command allows the user to change the current layer to a different layer by picking an entity on that layer.

Pulldown Menu Location: View
Keyboard Command: lset
Prerequisite: None

Change Layer

This command allows you to change the layer of a group of entities by selecting the group of entities. The layer name to assign can be either typed it or read from an existing entity by picking an entity that is on the layer that you want to change the group to.



Current Layer: 0

0
DISTXT
EXISTING
FINAL
PNTDESC
PNTELEV
PNTMARK
PNTNO
PNTS

Layer Name: FINAL

Prompts

Select entities to be changed.
Select objects: *pick entities*
The Select Layer dialog appears *select a layer from the list, or select Screen Pick*
If Screen Pick is chosen,
Pick entity with layer to change to: *pick another entity* This assigns the selected entities to the layer of this entity.
or
Enter new layer name or pick entity with layer (Enter/<Pick>)? *E*
Enter new layer name: *FINAL* This assigns the selected entities to the FINAL layer.

Pulldown Menu Location: View
Keyboard Command: lchg
Prerequisite: None

Freeze Layer

This command will freeze layers by picking entities on that layer. The entity selection is done by selection set for selecting one or more entities.

Prompts

Select entities on layers to be frozen.
Select objects: *pick entities*

Pulldown Menu Location: View
Keyboard Command: loff
Prerequisite: None

Thaw Layer

This command thaws the layers frozen by the Freeze Layer command.

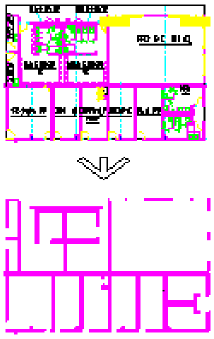
Pulldown Menu Location: View
Keyboard Command: lon
Prerequisite: None

Isolate Layer

This command freezes all the layers except the ones you select an entity on. The program prompts to see if you would like to retain the POINT layers which keeps the Carlson point layers from freezing. By default, these layers include PNTNO, PNTMARK, PNTDESC, and PNTELEV.

Prompts

Select objects on layers to isolate.
Select objects: *pick entities*
Retain POINT layers [Yes/<No>]? *Press Enter*



Isolate the wall layer by picking one wall line

Pulldown Menu Location: View
Keyboard Command: isolate
Prerequisite: None

Restore Layer

This command thaws the layers that were frozen by the *Isolate Layer* command.

Pulldown Menu Location: View
Keyboard Command: restore
Prerequisite: None

Draw Menu 5

Line

This command allows you to draw a line entity by picking points on the screen or by supplying the coordinate values using the point number and associated coordinates stored in the current coordinate file. The Line command links the line with the points when the line is drawn using point numbers if the Link Linework with Points option is turned on. This option is set under General Settings in the Configure command in the Settings menu. With links active, changing a point with a command like Move Points automatically updates the line. This command always draws 2D lines with a zero elevation.

Prompts

1 Pick point or point numbers: 1-3

You may enter a single point number or a range of point numbers

2 Undo/Distance/<Pick point or point numbers>: 16

3 Undo/+/-/Close/Distance/<Pick point or point numbers>: 35

4 Undo/+/-/Close/Distance/<Pick point or point numbers>: +

The + or - activates an additional prompt option that allows you to plot line segments at a 90 degree deflection angle from the last line.

5 Perpendicular Distance Right: 80

6 Undo/+/-/Close/Distance/<Pick point or point numbers>: -

The + or - activates an additional prompt option that allows you to plot line segments at a 90 degree deflection angle from the last line.

7 Perpendicular Distance Left: 105.12

8 Undo/+/-/Close/Distance/<Pick point or point numbers>: D

The distance option allows you to input a distance for the next line segment. The position of the cursor determines the angle.

9 Enter distance: 174.32

10Undo/+/-/Close/Distance/<Pick point or point numbers>: C

The close option draws a line segment back to the original starting point

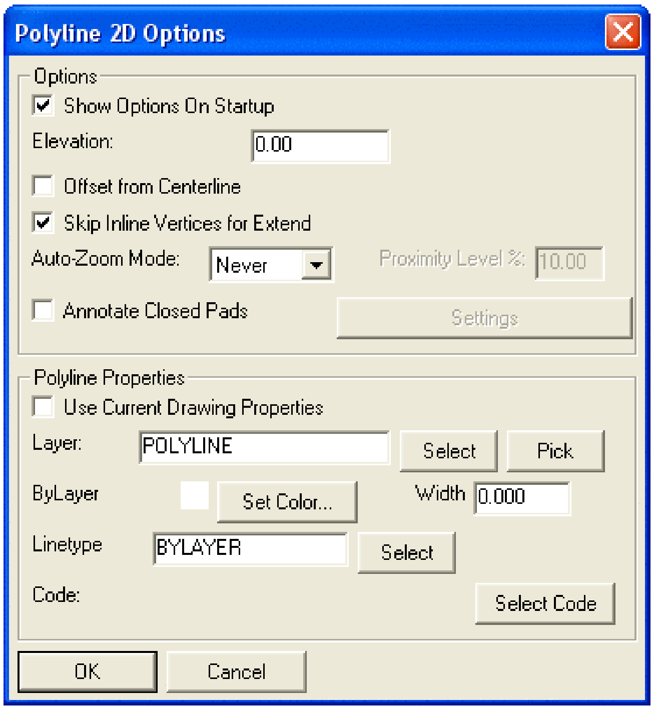
Prerequisite: None

Keyboard Command: 2DLINE

2D Polyline

A Polyline is a complex CAD entity comprised of one or more line and/or arc segments. One way to draw a polyline is to use the Command: line, pulldown menu or toolbar to execute the standard CAD command PLINE. While its elevation isn't necessarily zero, a polyline is 2-dimensional or flat.

The Carlson version of the PLINE command, **2D Polyline**, is available from the **Draw** pulldown menu, from the **Draw** toolbar or at the Command: line (**2DP**) and provides many more options than the standard CAD version of the command. Unless disabled, the **Polyline 2D Options** dialog box will appear after starting Carlson's **2D Polyline** command.


Polyline 2D Options

Options

☑ Show Options On Startup

Elevation: 0.00

☐ Offset from Centerline

☑ Skip Inline Vertices for Extend

Auto-Zoom Mode: Never

Proximity Level %: 10.00

☐ Annotate Closed Pads

Polyline Properties

☐ Use Current Drawing Properties

Layer: POLYLINE

ByLayer

Width 0.000

Linetype BYLAYER

Code:

Show Options on Startup: When this option is enabled, the **Polyline 2D Options** dialog box will display automatically upon starting the **2D Polyline** command. If disabled, the command runs strictly from the Command: line.

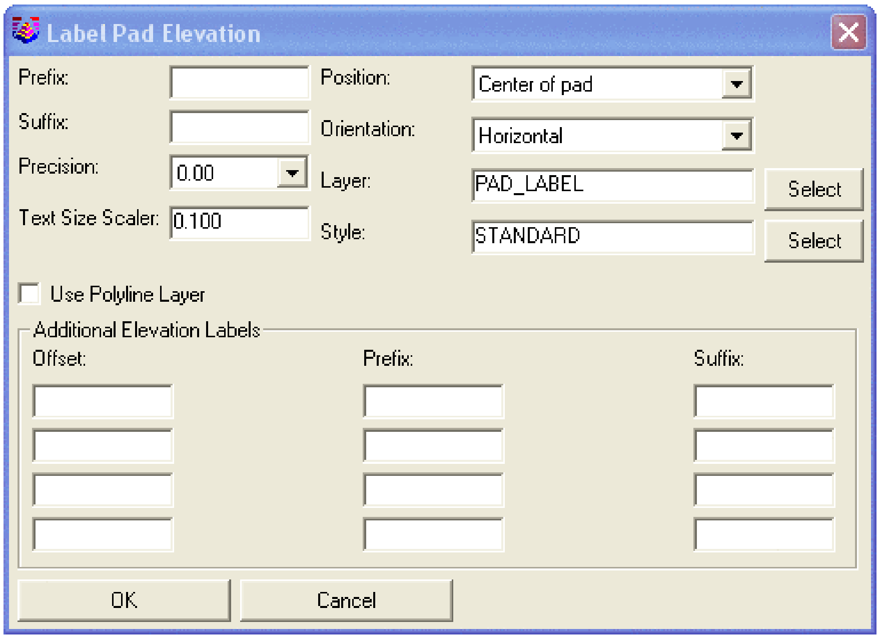
Elevation: Set the elevation of the polyline to be drawn.

Offset from Centerline: If this option is enabled, an additional option, Offset, is available from the Command: line. Issuing the "Offset" option allows you to draw a new polyline using Station and Offset entry from an existing polyline or existing Centerline (.CL) file.

Skip Inline Vertices for Extend: This setting applies to the "Extend" option with the Total Distance Sub-Menu option. If enabled, an existing vertex will dissolve when lengthening a 2D Polyline segment.

Auto-Zoom Mode: This setting provides 3 options for Auto-Zoom: Never, Proximity or Always. The "Never" setting requires you to manually Zoom or Pan to keep the current polyline vertex centered in the drawing screen. The "Proximity" setting will activate the "Proximity Level" setting and will automatically re-center the view only if the current polyline vertex is within a certain distance of the limits of the drawing area. The "Always" option will automatically re-center the view after each new polyline vertex is added.

Annotate Closed Pads: Enabling this option will activate the "Settings" button. The "Settings" button displays the **Label Pad Elevations** dialog box where you can specify label settings for the pad and other vertical offset elevations. For instance, you can label both the Finished Floor Elevation and the SubGrade elevation of a building pad at the same time using this command. See additional information on the **Label Pad Elevation** command.



Label Pad Elevation

Prefix:

Suffix:

Precision: 0.00

Text Size Scaler: 0.100

Position: Center of pad

Orientation: Horizontal

Layer: PAD_LABEL

Style: STANDARD

☐ Use Polyline Layer

Additional Elevation Labels

In the "Polyline Properties" section of the dialog box you have several alternatives for specifying the layer, color and linetype of the newly created polyline.

Use Current Drawing Properties: Select this option if you want the layer, color and linetype of the newly created polyline to match those currently set in the drawing.

Layer: Use this setting to manually assign the layer for the newly created polyline. You can type in the new layer name, use the "Select" button to choose an existing layer from the drawing's layer list or use the "Pick" button to select an entity in the drawing and match its layer.

Set Color: Use this button to manually specify a color for the newly created polyline.

Width: Specify the width of the newly created polyline.

Linetype: Use the "Select" button to manually specify a linetype for the newly created polyline.

Select Code: This option allows you to set the layer, color and linetype of a new polyline by using the properties assigned to a Field to Finish field code. The field code is selected from an existing Field Code table (.FLD) file that has been previously specified in the **Point Defaults** dialog box.

Prompts

Command:*2dp*
[Continue/Extend/Follow/Offset/OPtions/<Pick point or point numbers>]: *screen pick a point*
[Arc/Close/Distance/Follow/Offset/Undo/<Pick point or point numbers>]: *screen pick a point*
Segment length: 202.55, Total length: 202.55
[Arc/Close/Distance/Extend/Follow/Line/Offset/Undo/<Pick point or point numbers>]: *screen pick a point*
Segment length: 179.73, Total length: 382.28
[Arc/Close/Distance/Extend/Follow/Line/Offset/Undo/<Pick point or point numbers>]: *screen pick a point*
Segment length: 127.45, Total length: 509.73
[Arc/Close/Distance/Extend/Follow/Line/Offset/Undo/<Pick point or point numbers>]: *press Enter*
Command:

Options and SubMenu Options

Once all settings have been specified and the "OK" button is picked, the options shown below are available from the Command: line. To issue any of these options, simply type in the capitalized portion of the Option at the Command: line and press Enter. The default option is always shown between angle brackets < *Default* >.

Continue: This option allows you to select an existing polyline to which you'd like to add more line or arc segments. When prompted to "Select a polyline to continue or extend:", you may pick anywhere on the existing polyline and the new segment will begin at the ending vertex nearest your cursor. New line or arc segments can be added by screen-picking or using the options at the Command: line. Once finished adding segments, they are automatically joined to the original polyline.

Extend: This option gives you many ways to lengthen or shorten an existing polyline using the abbreviated SubMenu options shown below. Some of these options create additional segments at the end of the existing polyline and some allow you to change the length of the ending segment of the polyline. When prompted to "Select a polyline to continue or extend:", you may pick anywhere on the existing polyline and the "Extend" will occur at the ending vertex nearest your cursor. Once finished Extending, the new segments are automatically joined to the original polyline.

[I / R / L / S / T / A / B / E / U / X / Help / <Enter or Pick Distance>]

I - Input mode - This option toggles the distance input between feet & inches (will prompt first for feet, then prompt again for inches) and decimal feet.
R - Right rotate - From the ending vertex, turns the pointer 90-degrees to the right and then prompts for a distance.
L - Left rotate - From the ending vertex, turns the pointer 90-degrees to the left and then prompts for a distance.
S - Switch direction - From the ending vertex, turns the pointer 180-degrees and then prompts for a distance.
T - Total distance - Prompts you to "Enter total distance (100.00)" and displays the current length of the segment in parentheses. If a number smaller than the current distance is entered, this option will shorten the existing segment. If a number larger than the current distance is entered, this option will lengthen the existing segment. This option is also affected by the Skip Inline Vertices for Extend setting in the **Polyline 2D Options** dialog box. If "Skip Inline Vertices for Extend" is enabled, then the existing vertex will be dissolved when lengthening a segment. If the setting is not enabled, then the existing vertex will be left intact and an additional segment will be created inline.
A - Angle change - From the ending vertex, prompts you to "Enter Angle (ddd.mmss):" to turn the pointer by a specified angle and then prompts for a distance.
B - Bearing/Azimuth/Turned/Deflection - From the ending vertex, this option allows you to set the pointer direction by specifying an Angle. The Angle format is Qdd.mmss and there are a variety of ways to use the "Q" value to specify the Angle. See here for more.
E - Extend to edge - Extends current segment to another line or entity
U - Undo - Undo last action
X - Quit extend mode - Returns to normal 2D Polyline Draw mode
Help - Displays the descriptions of the Extend options
Enter or Pick Distance - Distance to extend the current segment

Follow: This option allows you to trace all or a portion of an existing polyline. After issuing the "Follow" option, you are prompted to "Select the polyline to Follow:" and then to "Specify the first follow point:". After snapping to a starting point on the polyline, you are asked whether you want to "Interpolate follow vertices elevations?". With this being a 2D Polyline, the answer to this is most likely "NO". You will then be prompted to specify the "Last follow point or follow distance:" where you can snap to another point on the polyline or type in a distance to trace the existing polyline.

Offset: With the "Offset" option, you will first be prompted to select an existing polyline or select an existing Centerline (.CL) file. Next, you will be asked to "Specify starting station:" where you will enter the station number of the first polyline vertex. Then, you will be prompted to "Enter Station" and "Enter Offset" for each vertex of the new polyline. Note: To have this option available, you must place a check next to Offset From Centerline in the **Polyline 2D Options** dialog box.

Pick Point or Point Numbers: This is the default prompt for the command. From here you can set a new polyline vertex by screen picking, entering coordinates in X,Y format or entering a point number from the associated Coordinate (.CRD) file.

Arc/Line: New polyline segments can be either an Arc or a Line segment. If the last polyline segment drawn was a LINE, then the "Arc" option will be shown as an available option; however, if the last polyline segment drawn was an ARC, then the "Line" option will be available.

When in the "Arc" mode, there are many additional SubMenu options available to you for creating an arc segment within the new polyline. The options are generated directly from the standard CAD version of the PLINE command and include Radius Point, Radius Length, Arc Length, Chord and Second Point (Point on Curve).

Close: This option will create a new Line or Arc segment back to the starting vertex of the polyline and results in a closed polyline.

Distance: This option allows you to first enter a distance for the new Line segment and then to specify the direction using one of three methods: Cursor, Line or Angle.
Cursor - This method will draw the polyline segment in the direction of your cursor position.
Line - This method prompts you to select a line or polyline segment to which it will draw a parallel segment.
Angle - This method prompts you for an Angle to determine the direction of your new polyline segment. The Angle format is Qdd.mmss and there are a variety of ways to use the "Q" value to specify the Angle. See here for more.

Undo: Undo the last drawn polyline segment.

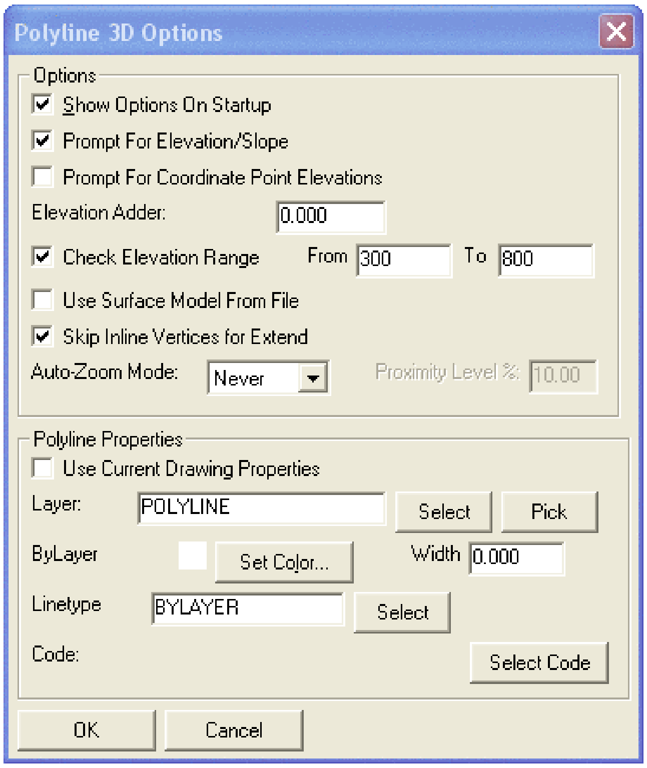
Angle Entry Methods
The Angle format is Qdd.mmss where: Q=quadrant/angle, d=degrees, m=minutes and s=seconds.
The Quadrant/Angle can be specified as:
1=NE (NorthEast)
2=SE (SouthEast)
3=SW (SouthWest)
4=NW (NorthWest)
5=AZ (AZimuth)
6=AL (turned Angle-Left)
7=AR (turned Angle-Right)
8=DL (Deflection angle-Left)
9=DR (Deflection angle-Right)

Pulldown Menu Location: Draw
Keyboard Command: 2DP
Prerequisite: None

3D Polyline

A 3D Polyline is a specialized version of a polyline that can have different elevation at every vertex.

The **3D Polyline** command is available from the **Draw** pulldown menu, from the **Draw** toolbar or at the Command: line (**3DP**). Unless disabled, the **Polyline 3D Options** dialog box will appear after starting Carlson's **3D Polyline** command.


Polyline 3D Options

Options

☑ Show Options On Startup

☑ Prompt For Elevation/Slope

☐ Prompt For Coordinate Point Elevations

Elevation Adder: 0.000

☑ Check Elevation Range From 300 To 800

☐ Use Surface Model From File

☑ Skip Inline Vertices for Extend

Auto-Zoom Mode: Never

Proximity Level %: 10.00

Polyline Properties

☐ Use Current Drawing Properties

Layer: POLYLINE

ByLayer

Width 0.000

Linetype BYLAYER

Code:

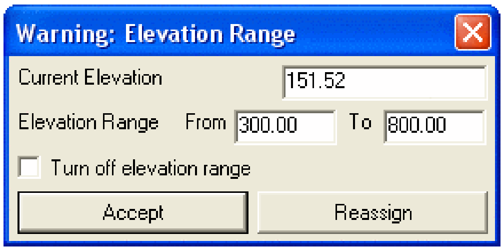
Show Options on Startup: When this option is enabled, the **Polyline 3D Options** dialog box will display automatically upon starting the **3D Polyline** command. If disabled, the command runs strictly from the Command: line.

Prompt for Elevation/Slope: When this option is enabled, the elevation for each new vertex will be displayed as a prompt, giving you an opportunity to override that value by typing in a new elevation. When disabled, the elevation to be assigned to each new vertex is displayed but you are not given a chance to assign a different elevation.

Prompt for Coordinate Point Elevations: This option only applies if you specify a point number from an associated Coordinate (.CRD) file to establish the X,Y,Z values for a new 3D Polyline vertex. When this option is enabled, the elevation for each new vertex will be displayed as a prompt, giving you an opportunity to override that value by typing in a new elevation. When disabled, the elevation to be assigned to each new vertex is displayed but you are not given a chance to assign a different elevation.

Elevation Adder: Use this setting to add a constant elevation value to all default elevation values.

Check Elevation Range: Enabling this option allows you to monitor elevations assigned to 3D Polyline vertices and issue a warning (with options to correct) if the elevation falls outside the specified range. If the proposed elevation of a 3D Polyline vertex falls outside the range specified, the **Warning: Elevation Range** dialog box is displayed. The **Warning: Elevation Range** dialog box allows you to assign a new elevation to the vertex, adjust the acceptable range of elevations or turn OFF monitoring of elevations.


Warning: Elevation Range

Current Elevation 151.52

Elevation Range From 300.00 To 800.00

☐ Turn off elevation range

Use Surface Model From File: Selecting this option allows you to use a Surface Model (.TIN, .GRD, .FLT) file to determine the elevation for each new 3D Polyline vertex.

Skip Inline Vertices for Extend: This setting applies to the "Extend" option with the Total Distance Sub-Menu option. If enabled, an existing vertex will dissolve when lengthening a 3D Polyline segment.

Auto-Zoom Mode: This setting provides 3 options for Auto-Zoom: Never, Proximity or Always. The "Never" setting requires you to manually Zoom or Pan to keep the current polyline vertex centered in the drawing screen. The "Proximity" setting will activate the "Proximity Level" setting and will automatically re-center the view only if the current polyline vertex is within a certain distance of the limits of the drawing area. The "Always" option will automatically re-center the view after each new polyline vertex is added.

In the "Polyline Properties" section of the dialog box you have several alternatives for specifying the layer, color and linetype of the newly created polyline.

Use Current Drawing Properties: Select this option if you want the layer, color and linetype of the newly created polyline to match those currently set in the drawing.

Layer: Use this setting to manually assign the layer for the newly created polyline. You can type in the new layer name, use the "Select" button to choose an existing layer from the drawing's layer list or use the "Pick" button to select an entity in the drawing and match its layer.

Set Color: Use this button to manually specify a color for the newly created polyline.

Width: Specify the width of the newly created polyline.

Linetype: Use the "Select" button to manually specify a linetype for the newly created polyline.

Select Code: This option allows you to set the layer, color and linetype of a new polyline by using the properties assigned to a Field to Finish field code. The field code is selected from an existing Field Code table (.FLD) file that has been previously specified in the **Point Defaults** dialog box.

Prompts

For A 3D Polyline With A Specified Elevation At Each Vertex:
Command: *3dp*
[Continue/Extend/Follow/Options/<Pick point or point numbers>]: *screen pick a point*
Interpolate/Object/<Elevation> <0.00>: *150.50*
Z: 150.50
[Arc/Close/Distance/Follow/Undo/<Pick point or point numbers>]: *screen pick a point*
Percent/Ratio/Elevation/Degree/Object/Osnap[.]/Next point or elevation<Interpolate>: *155.25*
Z: 155.25, Hz dist: 324.63, Slope dist: 324.66, Slope: 1.5% Ratio: 68.3:1
[Arc/Close/Distance/Extend/Follow/Line/Undo/<Pick point or point numbers>]: *screen pick a point*
Percent/Ratio/Elevation/Degree/Object/Osnap[.]/Next point or elevation<Interpolate>: *148.12*
Z: 148.12, Hz dist: 272.88, Slope dist: 272.98, Slope: -2.6% Ratio: -38.3:1
[Arc/Close/Distance/Extend/Follow/Line/Undo/<Pick point or point numbers>]: *press Enter*
Command:

For A 3D Polyline With Interpolated Elevations At One or More Vertices:
Command:*3dp*
[Continue/Extend/Follow/Options/<Pick point or point numbers>]: *screen pick a point*
Interpolate/Object/<Elevation> <0.00>: *91.73*
Z: 91.73
[Arc/Close/Distance/Follow/Undo/<Pick point or point numbers>]: *screen pick a point*
Percent/Ratio/Elevation/Degree/Object/Osnap[.]/Next point or elevation<Interpolate>: *screen pick a point*

```
This point elevation will be interpolated upon completion.
Percent/Ratio/Elevation/Degree/Object/Osnap[.]/Next point or elevation<Interpolate>: screen pick a point
This point elevation will be interpolated upon completion.
Percent/Ratio/Elevation/Degree/Object/Osnap[.]/Next point or elevation<Interpolate>: screen pick a point
This point elevation will be interpolated upon completion.
Percent/Ratio/Elevation/Degree/Object/Osnap[.]/Next point or elevation<Interpolate>: 94.44
Z: 94.44, Hz dist: 79.39, Slope dist: 122.88, Slope: 0.8% Ratio: 122.4:1
[Arc/Close/Distance/Extend/Follow/Line/Undo/<Pick point or point numbers>]: press Enter
Command:
```

Note that the difference between this and the previous example is that, instead of entering an elevation for each vertex, we are screen picking another new vertex. Each time we neglect to enter an elevation we are notified that, "This point elevation will be interpolated upon completion." After we specify "94.44" as the elevation of the last vertex, the slope of the interpolated segments is calculated using the total elevation change and the total length of all interpolated segments. Now, the elevations of all vertices can be determined and set based on the resulting slope.

Options and SubMenu Options

Once all settings have been specified and the "OK" button is picked, the options shown below are available from the Command: line. To issue any of these options, simply type in the capitalized portion of the Option at the Command: line and press Enter. The default option is always shown between angle brackets < *Default* >.

When starting a new 3D Polyline, the initial set of options assist you in setting the X,Y location of the first vertex:

Continue: This option allows you to select an existing polyline to which you'd like to add more line or arc segments. When prompted to "Select a polyline to continue or extend:", you may pick anywhere on the existing polyline and the new segment will begin at the ending vertex nearest your cursor. New line or arc segments can be added by screen-picking or using the options at the Command: line. Once finished adding segments, they are automatically joined to the original polyline.

Extend: This option gives you many ways to lengthen or shorten an existing polyline using the abbreviated SubMenu options shown below. Some of these options create additional segments at the end of the existing polyline and some allow you to change the length of the ending segment of the polyline. When prompted to "Select a polyline to continue or extend:", you may pick anywhere on the existing polyline and the "Extend" will occur at the ending vertex nearest your cursor. Once finished Extending, the new segments are automatically joined to the original polyline.

[I / R / L / S / T / A / B / E / U / X / Help / <Enter or Pick Distance>]

I - Input mode - This option toggles the distance input between feet & inches (will prompt first for feet, then prompt again for inches) and decimal feet.
R - Right rotate - From the ending vertex, turns the pointer 90-degrees to the right and then prompts for a distance.
L - Left rotate - From the ending vertex, turns the pointer 90-degrees to the left and then prompts for a distance.
S - Switch direction - From the ending vertex, turns the pointer 180-degrees and then prompts for a distance.
T - Total distance - Prompts you to "Enter total distance (100.00)" and displays the current length of the segment in parentheses. If a number smaller than the current distance is entered, this option will shorten the existing segment. If a number larger than the current distance is entered, this option will lengthen the existing segment. This option is also affected by the Skip Inline Vertices for Extend setting in the **Polyline 3D Options** dialog box. If "Skip Inline Vertices for Extend" is enabled, then the existing vertex will be dissolved when lengthening a segment. If the setting is not enabled, then the existing vertex will be left intact and an additional segment will be created inline.
A - Angle change - From the ending vertex, prompts you to "Enter Angle (ddd.mmss):" to turn the pointer by a

specified angle and then prompts for a distance.
B - Bearing/Azimuth/Turned/Deflection - From the ending vertex, this option allows you to set the pointer direction by specifying an Angle. The Angle format is Qdd.mmss and there are a variety of ways to use the "Q" value to specify the Angle. See here for more.
E - Extend to edge - Extends current segment to another line or entity
U - Undo - Undo last action
X - Quit extend mode - Returns to normal 3D Polyline Draw mode
Help - Displays the descriptions of the Extend options
Enter or Pick Distance - Distance to extend the current segment

Follow: This option allows you to trace all or a portion of an existing polyline. After issuing the "Follow" option, you are prompted to "Select the polyline to Follow:" and then to "Specify the first follow point:". After snapping to a starting point on the polyline, you are asked whether you want to "Interpolate follow vertices elevations?". After answering Yes or No, you will then be prompted to specify the "Last follow point or follow distance:" where you can snap to another point on the polyline or type in a distance to trace the existing polyline.

Options: This will display the **Polyline 3D Options** dialog box.

Pick Point or Point Numbers: This is the default prompt for the command. From here you can set a new polyline vertex by screen picking, entering coordinates in X,Y format or entering a point number from the associated Coordinate (.CRD) file.

After setting its location, the next set of options help you calculate the elevation of the initial vertex:

Interpolate: This option will set the elevation of the vertex by calculating the slope between other vertices of known elevation.
Object: This option allows you to "Select an elevation label or a point on a polyline:" to set the elevation of the vertex. Elevation labels such as "FFE: 124.85" or "Z: 124.85" can be selected.
Elevation: This is the default option and prompts you to type in the elevation for the vertex.

For subsequent 3D Polyline vertices, several options are added to assist you in setting the X,Y location of each new vertex:

Arc/Line: New polyline segments can be either an Arc or a Line segment. If the last polyline segment drawn was a LINE, then the "Arc" option will be shown as an available option; however, if the last polyline segment drawn was an ARC, then the "Line" option will be available.

When in the "Arc" mode, there are many additional SubMenu options available to you for creating an arc segment within the new polyline. The options are generated directly from the standard CAD version of the PLINE command and include Radius Point, Radius Length, Arc Length, Chord and Second Point (Point on Curve).

Close: This option will create a new Line or Arc segment back to the starting vertex of the polyline and results in a closed polyline.

Distance: This option allows you to first enter a distance for the new Line segment and then to specify the direction using one of three methods: Cursor, Line or Angle.
Cursor - This method will draw the polyline segment in the direction of your cursor position.
Line - This method prompts you to select a line or polyline segment to which it will draw a parallel segment.
Angle - This method prompts you for an Angle to determine the direction of your new polyline segment. The Angle format is Qdd.mmss and there are a variety of ways to use the "Q" value to specify the Angle. See here for more.

Undo: Undo the last drawn polyline segment.

After setting subsequent vertices, several more options are added to help you calculate the elevation of each new vertex:

Percent: This option allows you to specify the slope in Percent format (3%) from the previous vertex.
Ratio: This option allows you to specify the slope in Ratio format (for 3:1, enter 3) from the previous vertex.
Degree: This option allows you to specify the slope angle in decimal degree format (dd.dddd) from the previous vertex.
Osnap[.]: Using the [.] will toggle Running OSNAP settings ON or OFF.

Angle Entry Methods
The Angle format is Qdd.mmss where: Q=quadrant/angle, d=degrees, m=minutes and s=seconds.
The Quadrant/Angle can be specified as:
1=NE (NorthEast)
2=SE (SouthEast)
3=SW (SouthWest)
4=NW (NorthWest)
5=AZ (AZimuth)
6=AL (turned Angle-Left)
7=AR (turned Angle-Right)
8=DL (Deflection angle-Left)
9=DR (Deflection angle-Right)

Pulldown Menu Location: Draw
Keyboard Command: 3DP
Prerequisite: None

Circle

This command allows you to draw a circle.

Prompts

1 Pick center point or point number or [3P/2P/TTR]: pick point or specify option

- 3P: This option draws a circle based on three points on the circumference.
- 2P: This option draws a circle based on two endpoints of the diameter.
- TTR-Tangent, Tangent, Radius: This option draws a circle with a specified radius tangent to two objects.

2 Specify radius of circle or [Diameter]: enter a value

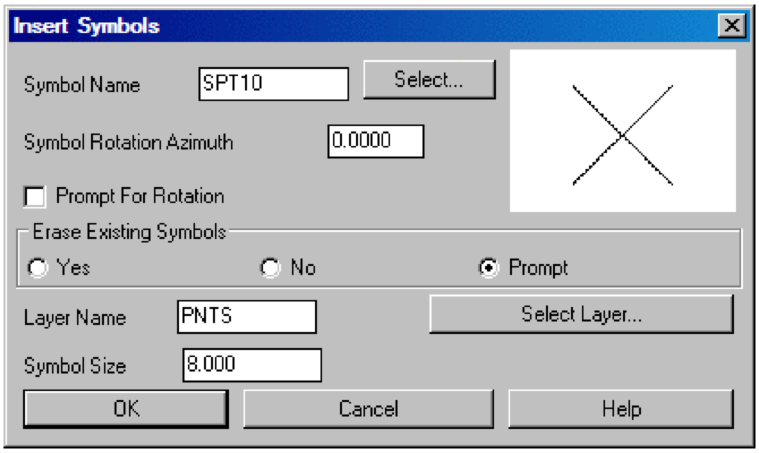
Sometimes more than one circle matches the criteria specified in the command. The circle whose tangent points are closest to the selected points is drawn.

Prerequisite: None

Keyboard Command: SCIRCLE

Symbols

This command inserts symbols from the symbol library into the drawing. The symbol library may be edited using the *Edit Symbol Library* command. The locations for the symbols can be specified by picking points, specifying point numbers in the current coordinate (.CRD) file or by entering the northing and easting. If you specify a point number, and that point number already has a symbol on it, you will be prompted whether or not to replace the existing symbol. Selecting the Enter coords option allows you to insert the symbol by entering a northing, easting and elevation. Using the Select entities option, symbols can also be placed on arcs, faces, points, text, lines and polylines. Under the Options command, you can turn prompting for rotation on or off. With rotation off, the symbol will be inserted horizontal to the current twist screen. Choose a symbol from the Select Symbol dialog by clicking on it. The Symbol Category choices are Points, Trees and Map Symbols. You may select a category by choosing the Symbol Category dropdown list. Within each category, use the scroll bar to view all of the symbols.



Insert Symbols

Symbol Name: SPT10

Symbol Rotation Azimuth: 0.0000

☐ Prompt For Rotation

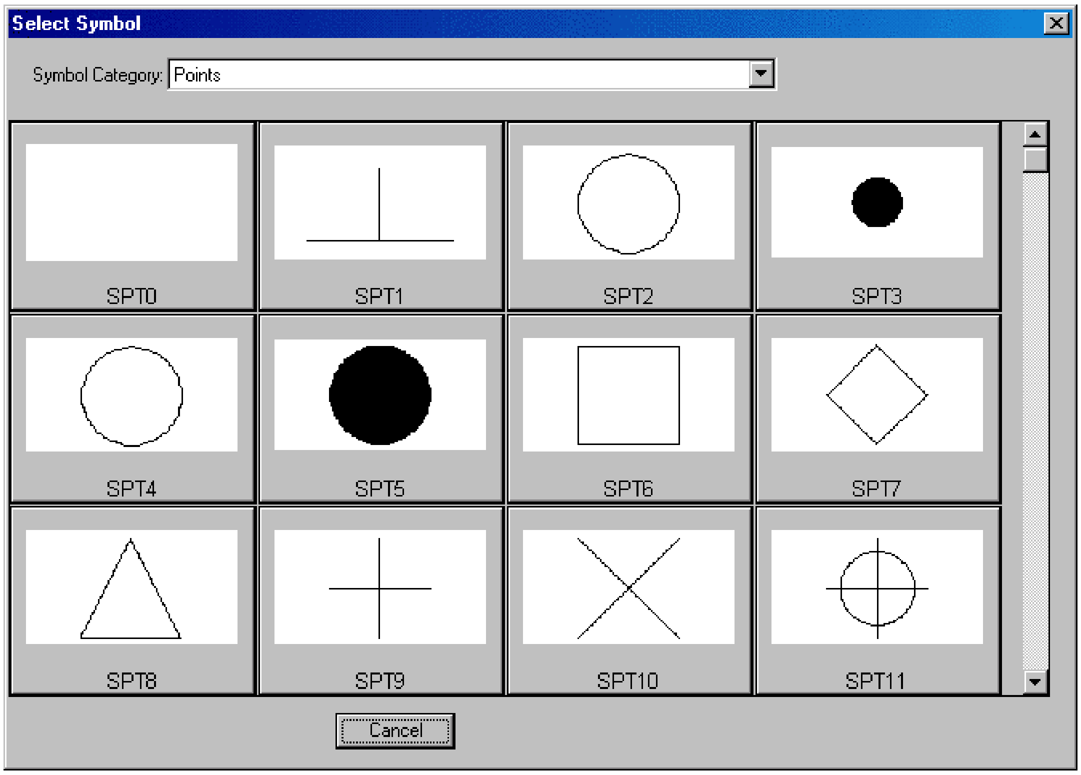
Erase Existing Symbols: ○ Yes ○ No ● Prompt

Layer Name: PNTS

Symbol Size: 8.000

Select...
Select Layer...
OK
Cancel
Help

Appears at start of command

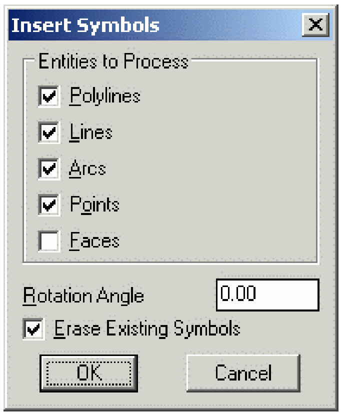


Select Symbol

Symbol Category: Points

SPT0
SPT1
SPT2
SPT3
SPT4
SPT5
SPT6
SPT7
SPT8
SPT9
SPT10
SPT11
Cancel

Appears when Select (symbol) is chosen



Entities to Process
☑ Polylines
☑ Lines
☑ Arcs
☑ Points
☐ Faces

Rotation Angle 0.00
☑ Erase Existing Symbols

Select entities dialog box

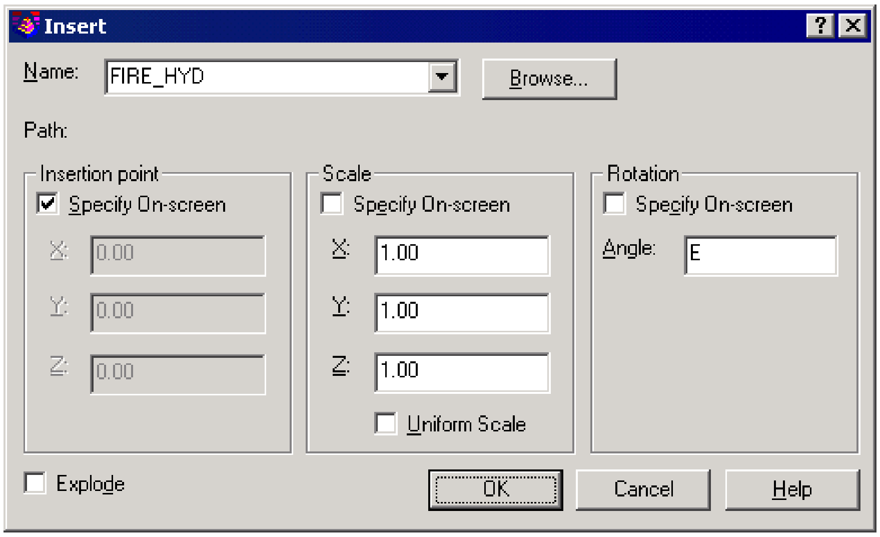
Prompts

Insert Symbols dialog *choose variables and click OK*
Options/Select entities/Enter coords/<Pick point or point numbers>: *pick a point*
Options/Select entities/Enter coords/<Pick point or point numbers>: *5-10* Inserts symbols at points 5-10 from the current coordinate file.
Options/Select entities/Enter coords/<Pick point or point numbers>: *S*
Insert Symbols dialog
Select arcs, faces, points, text, lines and polylines. *select objects*
Options/Select entities/Enter coords/<Pick point or point numbers>: *press Enter to end*

Keyboard Command: ptsym
Prerequisite: None

Insert Drawing

This command allows you to place a named block or drawing into the current drawing.



Name: FIRE_HYD
Path:

Insertion point
☑ Specify On-screen
X: 0.00
Y: 0.00
Z: 0.00

Scale
☐ Specify On-screen
X: 1.00
Y: 1.00
Z: 1.00
☐ Uniform Scale

Rotation
☐ Specify On-screen
Angle: E

☐ Explode

1 In the Insert dialog box, you specify the block to insert and define the position for the inserted block. The last block you insert during the current editing session becomes the default block for subsequent uses of this command.

- Name: This field specifies the name of a block to insert or the name of a file to insert as a block.

- Browse: This button opens the Select Drawing File dialog box (a standard file selection dialog box) where you can select a block or a file to insert.

2 Under Insertion Point, you specify the insertion point for the block.

- Specify On-Screen: This option specifies the insertion point of the block using the pointing device.
- X: This field sets the X coordinate value.
- Y: This field sets the Y coordinate value.
- Z: This field sets the Z coordinate value.

3 Under Scale, you specify the scale for the inserted block. Specifying negative values for the X, Y, and Z scale factors inserts a mirror image of a block.

- Specify On-Screen: This option specifies the insertion point of the block using the pointing device.
- X: This field sets the X coordinate value.
- Y: This field sets the Y coordinate value.
- Z: This field sets the Z coordinate value.
- Uniform Scale: This option specifies a single scale value for X, Y, and Z coordinates. A value specified for X is also reflected in the Y and Z values.

4 Under Rotation, you specify the rotation angle for the inserted block.

- Specify On-Screen: This option specifies the rotation angle of the block using the pointing device.
- Angle: This field sets a rotation angle for the inserted block.

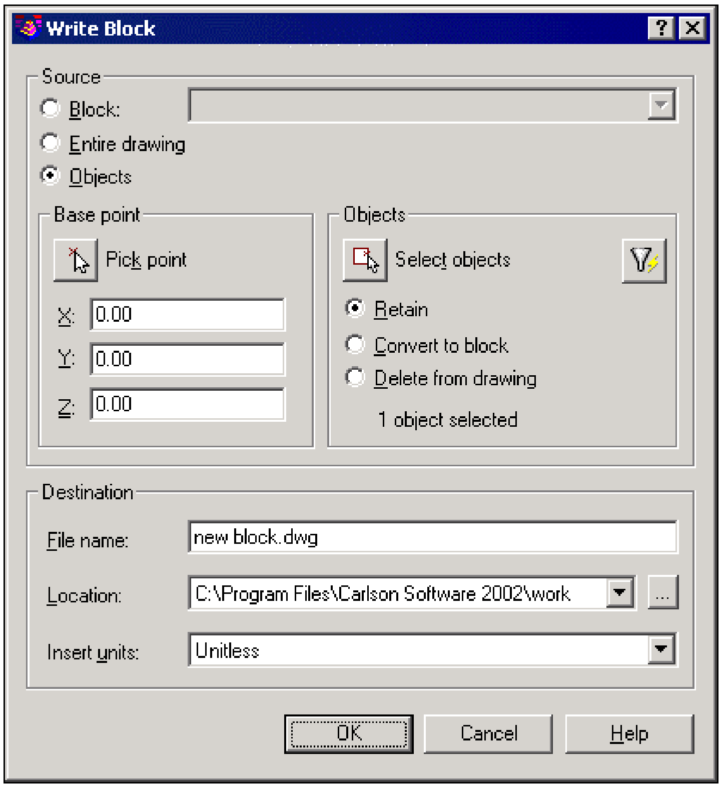
5 You can explode the block and inserts to the individual parts of the block. When you select Explode, you specify only an X scale factor.

Prerequisite: None

Keyboard Command: DDINSERT

Write Block

This command allows you to write objects or a block to a new drawing file.



Source
○ Block:
○ Entire drawing
● Objects

Base point
X: 0.00
Y: 0.00
Z: 0.00

Objects
● Retain
○ Convert to block
○ Delete from drawing
1 object selected

Destination
File name: new block.dwg
Location: C:\Program Files\Carlson Software 2002\work
Insert units: Unitless

The Write Block dialog box displays different default settings depending on whether nothing is selected, a single block is selected, or objects other than blocks are selected. For example, if you have a single block selected when you open the Write Block dialog box, the Source radio button is set to Block.

1 Under Source, you write selected blocks and objects out as a file, and specify insertion points.

- Block: This option specifies an existing block to save as a file. Select a name from the list.
- Entire Drawing: This option selects the current drawing as a block.
- Objects: This option specifies objects to be saved as a file.

2 Under Base Point, you must specify a base point for the block. The default value is 0,0,0.

- X: This field specifies the X coordinate value.
- Y: This field specifies the Y coordinate value.
- Z: This field specifies the Z coordinate value.
- Pick Point: This option allows you to temporarily close the dialog box so that you can specify an insertion base point in the current drawing.

3 Under Objects, you specify the objects to include in the new block and whether to retain or delete the selected objects or convert them to a block instance after you create the block.

- Retain: This option retains the selected objects as distinct objects in the drawing after you create the block.
- Convert to block: This option converts the selected objects to a block instance in the drawing after you create the block.
- Delete from drawing: This option deletes the selected objects from the drawing after you create the block.
- Select objects: This option dismisses the Block Definition dialog box temporarily while you select the objects for the block. When you finish selecting objects, press Enter to redisplay the Block Definition dialog box.
- Quick Select: This option displays the Quick Select dialog box, which defines a selection set.
- Objects Selected: This option displays the number of selected objects.

4 Under Destination, specify the name, location, and unit value used for the objects in the file.

- File Name: This field specifies a file name that the block or objects will be saved to.
- Location: This field specifies the drive and directory path for the file.
- Insert Units: This field specifies the unit value to be used when the new file is inserted as a block. Enter 0 (zero) if you do not want to scale the drawing to a specific value as you insert it.

Prerequisite: Drawing entities

Keyboard Command: WBLOCK

Text

Creates a single-line text object.

You can use the TEXT to enter several lines of text that you can rotate, justify, and resize. As you type at the Enter Text prompt, the text you are typing is displayed on the screen. Each line of text is a separate object. To end a line and begin another, press Enter after entering characters at the Enter Text prompt. To end the TEXT command, press Enter without entering any characters at the Enter Text prompt.

By applying a style to the text, you can use a variety of character patterns or fonts that you can stretch, compress, make oblique, mirror, or align in a vertical column.

If TEXT was the last command entered, pressing ENTER at the Specify Start Point of Text prompt skips the prompts for height and rotation angle and immediately displays the Enter Text prompt. The text is placed directly beneath the previous line of text. The point specified at the prompt is also stored as the Insertion Point object snap.

Prompts

1 Current text style: "MONO" Text height: 4.00

2 Specify start point of text or [Justify/Style]: S

The style option lets you change the textstyle on the fly

3 Enter style name or [?] <MONO>: STANDARD

4 Current text style: "STANDARD" Text height: 4.00

5 Specify start point of text or [Justify/Style]: J

The justify option lets you specify the justification for the text.

6 Enter an option [Align/Fit/Center/Middle/Right/TL/TC/TR/ML/MC/MR/BL/BC/BR]: BC

In this case BC = Bottom Center

7 Specify bottom-center point of text: pick point or enter coordinates

8 Specify height <4.00>: press enter to select default or enter text height

9 Specify rotation angle of text <0d0'0">: press enter to select default or enter angle

10Enter text: Found Iron Pin

11Enter text: press enter to end

Prerequisite: None

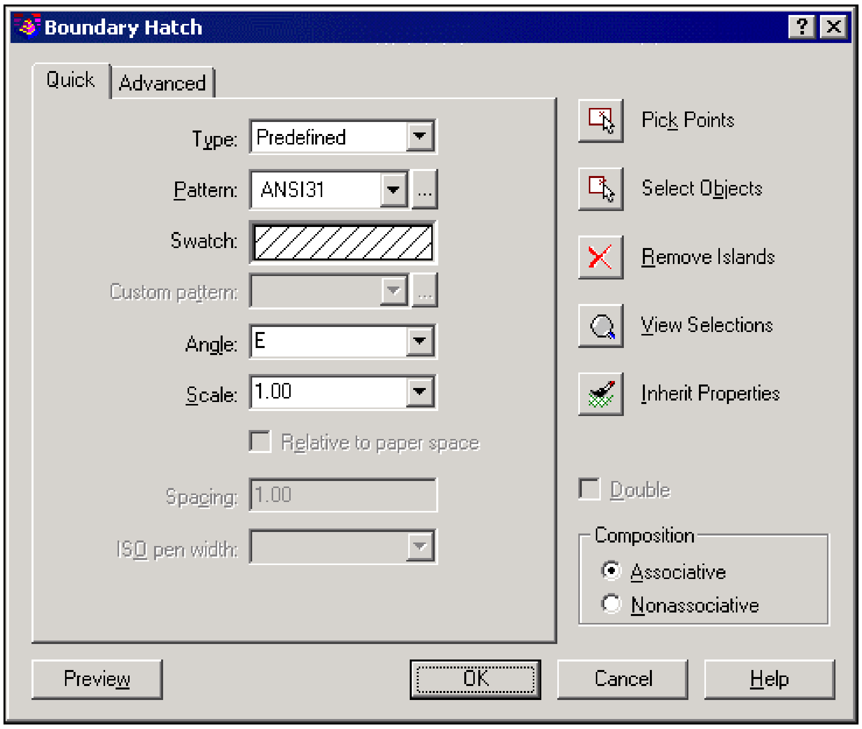
Keyboard Command: DTEXT, TEXT

Hatch

This command allows you to fill an enclosed area or selected objects with a hatch pattern.

The Hatch command first defines the boundaries of the area you want to hatch, either by computing a region or polyline boundary from a specified point within an enclosed area, or by using selected objects as boundaries. It then fills the boundaries with a hatch pattern or a solid color. You can create an associative hatch, which updates when its boundaries are modified, or a nonassociative hatch, which is independent of its boundaries. You can preview any hatch and adjust the definition.

Due to the large number of combinations of geometry that you can hatch, editing hatched geometry can produce unexpected results. In this event, delete the hatch object and rehatch.



Type: Predefined

Pattern: ANSI31

Angle: E

Scale: 1.00

☐ Relative to paper space

Spacing: 1.00

☐ Double

● Associative

○ Nonassociative

The Boundary Hatch dialog box defines the boundary, pattern type, pattern properties, and attributes for hatch objects. Use the Quick Tab to work with hatch patterns and quickly create a hatch. Use the Advanced Tab to customize how TakeOff creates and hatches boundaries.

1 Under the Quick Tab you define the appearance of the hatch pattern to be applied.

- Type: This field sets the pattern type.

- Pattern: This field lists the available predefined patterns. The six most recently used predefined patterns appear at the top of the list. The Pattern option is available only if you set Type to Predefined.

- [...]: This button displays the Hatch Pattern Palette dialog box, in which you can view preview images for all predefined patterns at once to help you make a selection.

- Swatch: This field displays a preview of the selected pattern. You can click the swatch to display the Hatch Pattern Palette dialog box.

- Custom Pattern: This field lists the available custom patterns. The six most-recently used custom patterns appear at the top of the list. The Custom Pattern option is available only if you set Type to Custom.

- Angle: This field specifies an angle for the hatch pattern relative to the X axis of the current UCS.

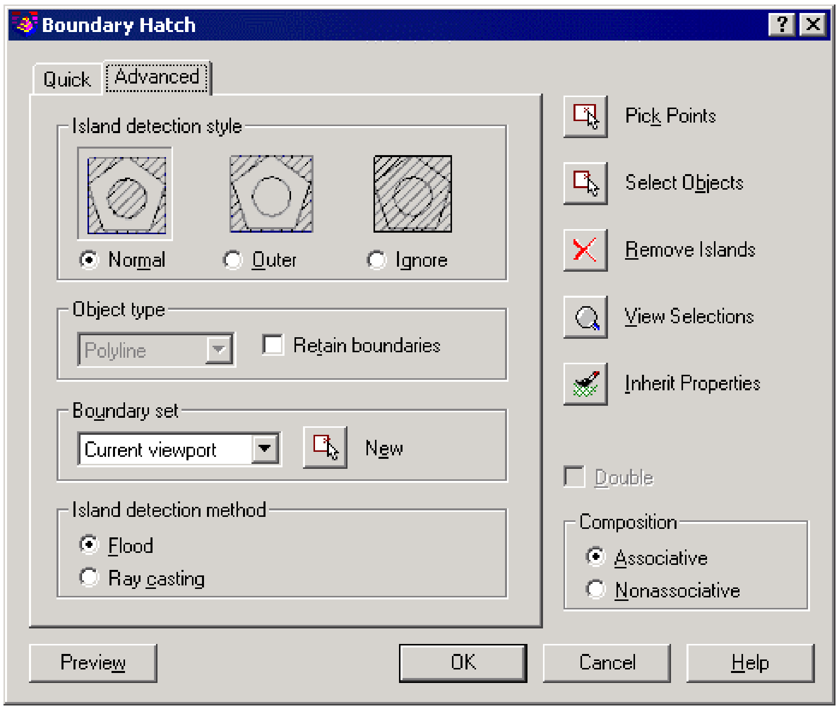
- Scale: This option expands or contracts a predefined or custom pattern. This option is available only if you set Type to Predefined or Custom.

- Relative to Paper Space: This option scales the hatch pattern relative to paper space units. Using this option, you can easily display hatch patterns at a scale that is appropriate for your layout. This option is available only from a layout.

- Spacing: This option specifies the spacing of lines in a user-defined pattern. This option is available only if you set Type to User Defined.

- ISO Pen Width: This option scales an ISO predefined pattern based on the pen width you choose. This option is available only if you set Type to Predefined and set Pattern to one of the available ISO patterns.

2 Under the Advanced Tab you define how TakeOff creates and hatches boundaries.



Island detection style: ● Normal ○ Outer ○ Ignore

Object type: Polyline ☐ Retain boundaries

Boundary set: Current viewport New

Island detection method: ● Flood ○ Ray casting

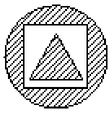
☐ Double

Composition: ● Associative ○ Nonassociative

- Island Detection Style: This option allows you to specify the method for hatching objects within the outermost hatch boundary. If no internal boundaries exist, specifying an Island Detection style has no effect. Because you can define a precise set of boundaries, it's often best to use the Normal style.

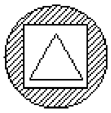
The illustrations that accompany each style show how the program hatches a group of three nested boundary objects in each case.

Normal



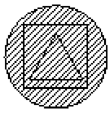
Hatches inward from the outer boundary. If the program encounters an internal intersection, it turns off hatching until it encounters another intersection. Thus, areas separated from the outside of the hatched area by an odd number of intersections are hatched, and areas separated by an even number of intersections are not.

Outer



Hatches inward from the outer boundary. The program turns hatching off if it encounters an internal intersection. Because this process starts from both ends of each hatch line, the program hatches only the outermost level of the structure and leaves the internal structure blank.

Ignore



Ignores all internal objects and hatches through them.

Hatching concave curves with the Outer and Ignore styles can cause hatching discrepancies.

The Normal, Outer, and Ignore options are also available from a shortcut menu by right-clicking in the drawing area while you specify points or select objects to define your boundaries.

- Object Type: This option allows you to specify whether to retain boundaries as objects, and specifies the object type TakeOff applies to those boundary objects. Object Type controls the type of the new boundary object. TakeOff creates the boundary as a region or a polyline. This option is available only if you select Retain Boundaries.

- Retain Boundaries: This option adds the temporary boundary objects to the drawing.

- Boundary Set: This field defines the set of objects TakeOff analyzes when defining a boundary from a specified point. The selected boundary set has no effect when you use Select Objects to define a boundary. By default, when you use Pick Points to define a boundary, the program analyzes all objects visible in the current viewport. By redefining the boundary set, you can disregard certain objects when defining boundaries without having to hide or remove those objects. For large drawings, redefining the boundary set can also produce the boundary faster because the program examines fewer objects.

- New: This option prompts you to select the objects that define the boundary set. When you choose this option, the dialog box temporarily closes, prompting you to select objects. TakeOff includes only the hatchable objects you select when it constructs the new boundary set. TakeOff discards any existing boundary set, replacing it with the new boundary set defined by the objects you select. If you don't select any hatchable objects, the program retains any current set. Until you exit the Hatch command or create a new boundary set, TakeOff ignores objects that do not exist in the boundary set when you define your boundaries using Pick Points.

- Island Detection Method: This option allows you to specify whether to include objects within the outermost boundary as boundary objects. These internal objects are known as islands.

- Flood: This option includes islands as boundary objects.

- Ray Casting: This option runs a line from the point you specify to the nearest object and then traces the boundary in a counterclockwise direction, thus excluding islands as boundary objects.

3 In the Boundary Hatch dialog box, you set the options the define the selection set.

- Pick Points: This option determines a boundary from existing objects that form an enclosed area. How TakeOff detects objects using this option depends on the selected Island Detection Method on the Advanced tab. For example, if the Island Detection Method is Flood, the program detects objects within the outermost boundary as islands and includes them in the boundary definition. The Island Detection Style (which you also set on the Advanced tab) then determines how to hatch the detected islands. When you choose Pick Points, the dialog box closes temporarily, and the program prompts for point specification.

- Select Objects: This option allows you to select specific objects for hatching. The dialog box closes temporarily, and the program prompts you for object selection. When you define your boundaries using Select Objects, the program does not detect interior objects automatically. You must select the objects within the selected boundary to hatch those objects according to the current Island Detection Style (which you set on the Advanced tab). Each time you choose Select Objects, the program clears the previous selection set. While selecting objects, you can right-click at any time in the drawing area to display a shortcut menu. You can undo the last or all selections, change the selection method, change the island detection style, or preview the hatch.

- Remove Islands: This option removes from the boundary definition any of the objects that the program detects as islands when you use Pick Points. You cannot remove the outer boundary.

- View Selections: This option temporarily dismisses the dialog box and displays the currently defined boundaries with the hatch settings that you last previewed. This option is unavailable when you have not yet specified points or selected objects.

- Inherit Properties: This option hatches specified boundaries using the hatch properties of one object. After selecting the associative hatch object whose properties you want the hatch to inherit, you can right-click in the drawing area and use the shortcut menu to toggle between the Select Objects and Pick Internal Point options to create boundaries.

- Double: For user-defined patterns, this option draws a second set of lines positioned at 90 degrees to the original lines, creating a crosshatch. This option is available only if you set Type to User Defined on the Quick tab.
- Associative: This option creates an associative hatch, meaning that the hatch is updated when you modify its boundaries.
- Nonassociative: This option creates a nonassociative hatch, meaning that it is independent of its boundaries.
- Preview: This option temporarily dismisses the dialog box and displays the currently defined boundaries with the current hatch settings. This option is not available when you have not yet specified points or selected objects to define your boundaries.

Prerequisite: None

Keyboard Command: BHATCH

2 Tangents, Radius

This command fits a curve between two tangent lines by entering a known radius. It prompts for the radius and then prompts to pick points on the two tangent lines.

Prompts

Radius of Arc <300.000>: *press Enter*
[nea] Pick Point on 1st Tangent Line:*pick a point*
[nea] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Arc
Keyboard Command: 2tanlin
Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Arc Length

This command fits a curve between two tangent lines and a known arc length. It prompts for the arc length then pick the P.I. (intersection of tangent lines) and points on the two tangent lines.

Prompts

Arc Length <100.00>: *press Enter or enter distance*
[int on] Pick P.I. of curve: *pick intersection of tangent lines*
[nea on] Pick pnt on 1st Tangent Line: *pick a point*
[nea on] Pick pnt on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Arc
Keyboard Command: 2tanlal
Prerequisite: Tangent lines should be drawn before execution

2 Tangents, Chord Length

This command fits a curve between two tangent lines and a known chord length. It prompts for the chord length, the P.I. and points on the two tangent lines.

Prompts

Chord Length <100.00>: *press Enter*
[int on] Pick P.I. of curve: *pick a point*
[nea on] Pick Point on 1st Tangent Line: *pick a point*
[nea on] Pick Point on 2nd Tangent Line: *pick a point*

Pulldown Menu Location: Draw > Arc
Keyboard Command: 2tanlcl
Prerequisite: Tangent lines should be drawn before execution

3 Point

This command draws an arc between three points. The first point is the PC, the second is a point on the arc and the third is the PT. The points can either by picked on-screen or specified by point number.

Prompts

Pick PC point or point numbers: *101* (For point number 101.)
Pick Second point or point number: *102*
Pick PT point or point number: *103*

Pulldown Menu Location: Draw > Arc
Keyboard Command: 3PA
Prerequisite: None

PC, PT, Radius Point

This command draws an arc between the PC point, radius point and PT point. The points can either by picked on-screen or specified by point number. Given these points, the arc can be drawn clockwise or counterclockwise. The program shows one direction and asks if it is correct. If you need the arc to go the other direction, enter No.

Prompts

Pick PC point or point number: *101*
Pick Radius point or point number: *102*
Pick PT point or point number: *103*
Is the direction of this arc correct ? No/<Yes>: *N*

Pulldown Menu Location: Draw > Arc
Keyboard Command: pca
Prerequisite: None

PC, Radius, Chord

This command draws an arc, given the PC point, radius length, chord length and chord bearing. The PC point can either by picked on-screen or specified by point number. Given these points, the arc can be drawn clockwise or counter-clockwise. The program shows one direction and asks if it is correct. If you need the arc to go the other direction, enter No.

Prompts

Radius of Arc <-40.00>: *500*
PC Start Point ?
Pick point or point number: *pick a point*
Chord bearing or chord endpoint (<Bearing>/Point)? *Press Enter*
Enter Bearing (Qdd.mmss) <90.0000>: *145.1041* (for NE 45d10'41")
Chord Length <200.46>: 200
Is this arc in the correct direction (<Yes>/No)? *Press Enter*

Pulldown Menu Location: Draw > Arc
Keyboard Command: srcb
Prerequisite: None

Raster Image

This command allows you to manage raster images.

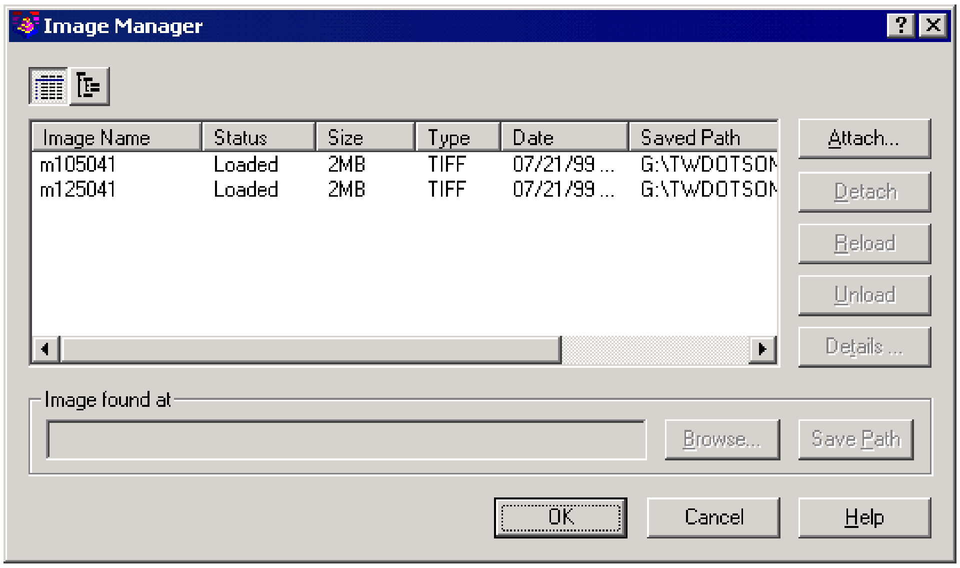


Image Name	Status	Size	Type	Date	Saved Path
m105041	Loaded	2MB	TIFF	07/21/99 ...	G:\TWDOTSON
m125041	Loaded	2MB	TIFF	07/21/99 ...	G:\TWDOTSON

1 The Image Manager dialog box lists all the image files attached to the current drawing. You can view the parameters and details for selected images. You can attach new image files and detach, locate, reload, and unload existing images.

- List View: This button lists the image definitions attached to the drawing. Each image name appears only once regardless of how many times you attach (insert) the image. You can sort the list of images by name, status (loaded, unloaded, or not found), size, type (TIFF, for example), date, or the saved path and file name. By default, TakeOff displays the list alphabetically by image name.

To select multiple images, hold down SHIFT or CTRL while selecting items.

To sort the list alphabetically or numerically by a specific column, click that column's heading.

To change the width of the column, drag the line between the column headings to the right or left. The program saves and restores the settings when you reopen the dialog box.

To change an image name, select it and then click it again, or select it and then press F2. You cannot edit names of images that reside in external references (xrefs). Image names can include up to 255 characters and can contain letters, digits, spaces, and any special characters not used by Microsoft® Windows® or TakeOff. The image name can be identical to the file name, but changing the image name does not change the file name.

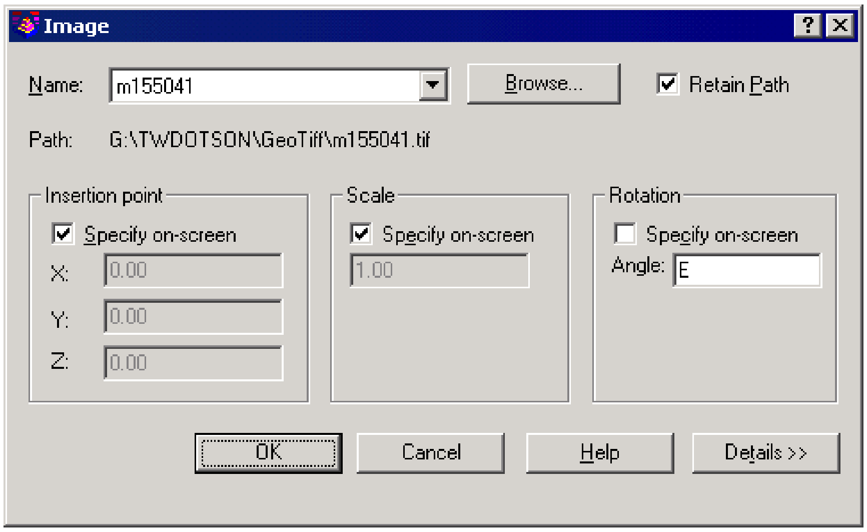
- Tree View: This button displays all the image definitions and the levels of nesting of images within xrefs. The top level of the tree view shows images that you attached directly to the drawing, images nested in block references, and the names of externally referenced drawings containing images. The names of the images attached to the externally referenced drawings appear nested within the drawing at the next tree level. To insert a copy of an already attached image, select it, and then choose Attach.

Tree view lists the image names only (not file names) and lists the image name just once, regardless of how many times you attach (insert) the image.

You can edit an image name by selecting it and then clicking it again, or by selecting it and then pressing F2. However, you cannot select more than one image at a time.

- Attach: This option displays the Select Image File dialog box. When you unload and then reload an image, the program draws that image on top. Images remain loaded or unloaded from one drawing session to the next.
- Detach: This option removes the selected image definitions from the drawing database and erases all the associated image objects from the drawing and from the display.
- Reload: This option loads the most recent version of an image or reloads an image that was previously unloaded. Reloading does not control whether the image is displayed, but it ensures display of the most current image.
- Unload: This option unloads image data from working memory without erasing the image objects from the drawing. It is recommended that you unload images no longer needed for editing to improve performance. An unloaded image cannot be displayed or plotted. You can selectively load and unload individual images from a working list of images associated with the drawing file.
- Details: This option opens the Image File Details dialog box, which displays the image name, saved path, active path, file creation date and time, file size and type, color system, color depth, width and height in pixels, resolution, default size in units, and a preview image.
- Image Found At: This field shows the path of the selected image. If you select multiple images, this field remains blank. The path shown is the actual path where the image resides.
- Browse: This option opens the Select Image File dialog box (a standard file selection dialog box). The path you select appears under Image Found At.
- Save Path: This option stores the new path information. Press ESC while editing the path to restore the old path. If the program cannot find the referenced image in the new path, the image's status changes to Not Found. If you do not choose Save Path after editing the path, the program uses the original image path the next time you load the drawing.

2 Under the Image dialog box, you can attach an image.


Name: m155041

☑ Retain Path

Path: G:\TWDOTSON\GeoTiff\m155041.tif

Insertion point

☑ Specify on-screen

X: 0.00

Y: 0.00

Z: 0.00

Scale

☑ Specify on-screen

1.00

Rotation

☐ Specify on-screen

Angle: E

3 In the Image dialog box, you must first identify the image and the path.

- Name: This field identifies the image you have selected to attach, either from the Select Image File dialog box (an unattached image) or from the list of previously attached images. To add another instance of an image file that is already attached, select the image name from the list and choose OK.

- Browse: This option opens the Select Image File dialog box (a standard file selection dialog box). If Show Preview is selected, the program displays a preview of the selected file.
- Retain Path: This option saves the path of the image file with the image definition. If Retain Path is not selected, only the image name is saved and TakeOff searches the Support File Search Path.

4 Under Insertion Point, you must specify the insertion point for the selected image. Specify On-Screen is the default. The default insertion point is 0,0.

- Specify On-Screen: This option directs input to the command line or the pointing device. If Specify On-Screen is cleared, enter the insertion point in X, Y, and Z.
- X: This field sets the X coordinate value.
- Y: This field sets the Y coordinate value.
- Z: This field sets the Z coordinate value.

5 Under Scale, you must specify the scale factor of the selected image. Specify On-Screen directs input to the command line or the pointing device. If Specify On-Screen is cleared, enter a value for the scale factor. The default scale factor is 1.

6 Under Rotation, you must specify the rotation angle of the selected image. If Specify On-Screen is selected, you may wait until you exit the dialog box to rotate the object with your pointing device or enter a rotation angle value on the command line. If Specify On-Screen is cleared, enter the rotation angle value in the dialog box. The default rotation angle is 0.

Prerequisite: Raster image

Keyboard Command: IMAGE

Place Image by World File

Function

This function allows you to insert Geo-Referenced TIF files into AutoCAD drawings. This process requires the presence of an accompanying TFW file. The TFW file contains information about the location and scaling of the actual raster image TIF file. This eliminates the guesswork in inserting, moving, and rotating raster images to the project area. You begin by selecting the TFW or JGW file to process. If the related TIF file is present in the same directory, the image will be inserted into the proper coordinates.

Prompts

Select World File: *choose existing .TFW or .JGW file*

Keyboard Command: geotiff
Prerequisite: None

Closed Polyline By Interior Text

This command allows you to create closed polylines from existing linework. Select all the entities (lines, arcs, or polylines) you would like to use, specify desired snap tolerance (for joining broken lines), then click inside the boundary you would like to close, and the command will generate corresponding closed polylines. Duplicate polylines are detected and are not created. The new polylines are always created on the current layer; the layers of the original linework are not used.

Prompts

1 Select polylines: **pick entitie**s

2 Select objects: **pick entities**

3 Select objects: **Press Enter**

4 Enter snap tolerance <0.0>: **enter a value**

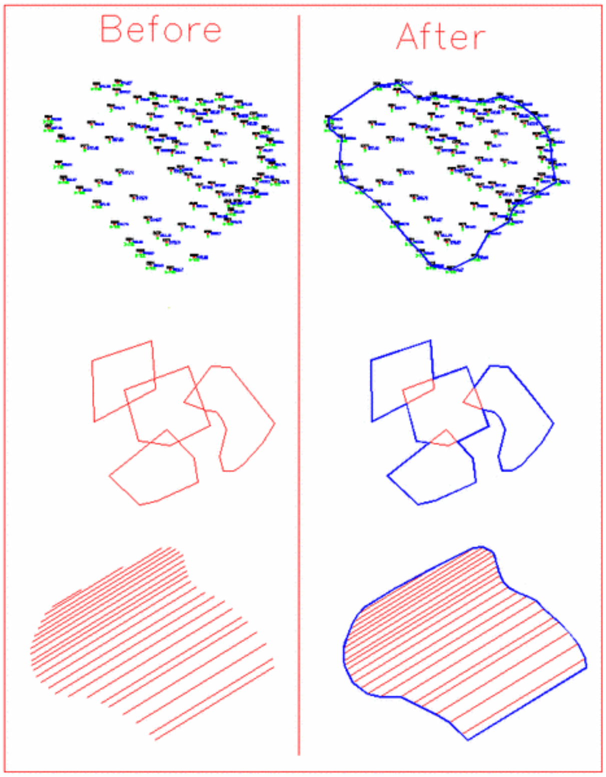
5 Pick an internal point: **pick a point**

Prerequisite: Entities on screen.

Keyboard Command: BOUNDPL

Shrink-Wrap Entities

This command creates a closed polyline which encloses a given set of entities. The resulting polyline is created in the current layer. The program works on either point entities or polylines. For points, the program creates a closed polyline through the points around the perimeter of the area defined by the points. For polylines, the shrink-wrap polyline follows the outside border of the selected polylines. The polylines that are processed have to be connected to be shrink-wrapped. The snap tolerance is the maximum gap that will be joined to make the closed polyline. For open polylines, as in the bottom figure, the Gap method works better, as it jumps across the gaps and connects the end points.



Prompts

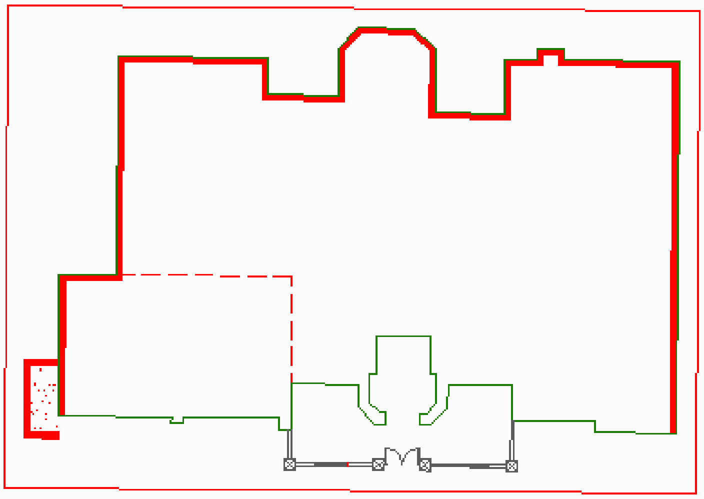
Shrink-wrap across gaps or bounded linework only [<Gap>/Bound]? *G*
Shrink-wrap layer <FINAL>:
Select points and linework to shrink-wrap.
Select objects: *select entities to process*
Reading points... 46
Inserted 46 points.
Inserted 23 breakline segments
Perimeter reduction level 0-3 (0-None, 3-Most) <2>: *2*

Reduce Perimeter Pass: 1 Removed: 5
Reduce Perimeter Pass: 2 Removed: 3
Reduce Perimeter Pass: 3 Removed: 4
Reduce Perimeter Pass: 4 Removed: 2
Reduce Perimeter Pass: 5 Removed: 1
Reduce Perimeter Pass: 6 Removed: 0
Create 2D or 3D Polyline [<2D>/3D]? *2D*

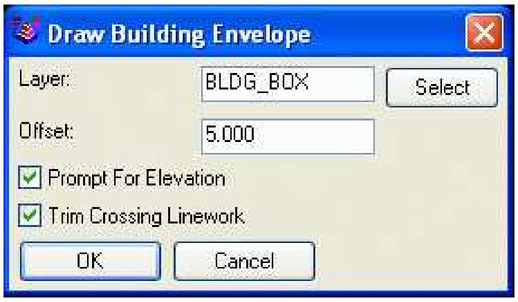
Pulldown Menu Location: Draw
Keyboard Command: swplines
Prerequisite: Entities

Building Envelope Polyline

This command creates a rectangler polyline around selected linework. This can be used to give a building all one elevation.



Select the entities that make up the building. Next you will be prompted to name the layer and to set an offset distance (The above example is offset by 5 feet). Also, you can set the elevation of the envelope and trim crossing linework to ensure you have a flat pad.



Layer: BLDG_BOX
Offset: 5.000
☑ Prompt For Elevation
☑ Trim Crossing Linework

Prompts

Draw Building Envelope dialog
Select building lines.
Select objects: *pick the linework that makes up the perimeter of the building*

Draw another building envelope [<Yes>/No]? *N*

Prerequisite: a pad

Keyboard Command: bldg_perim

Title Block

This function is different depending on your AutoCAD version

Function (AutoCAD R14)

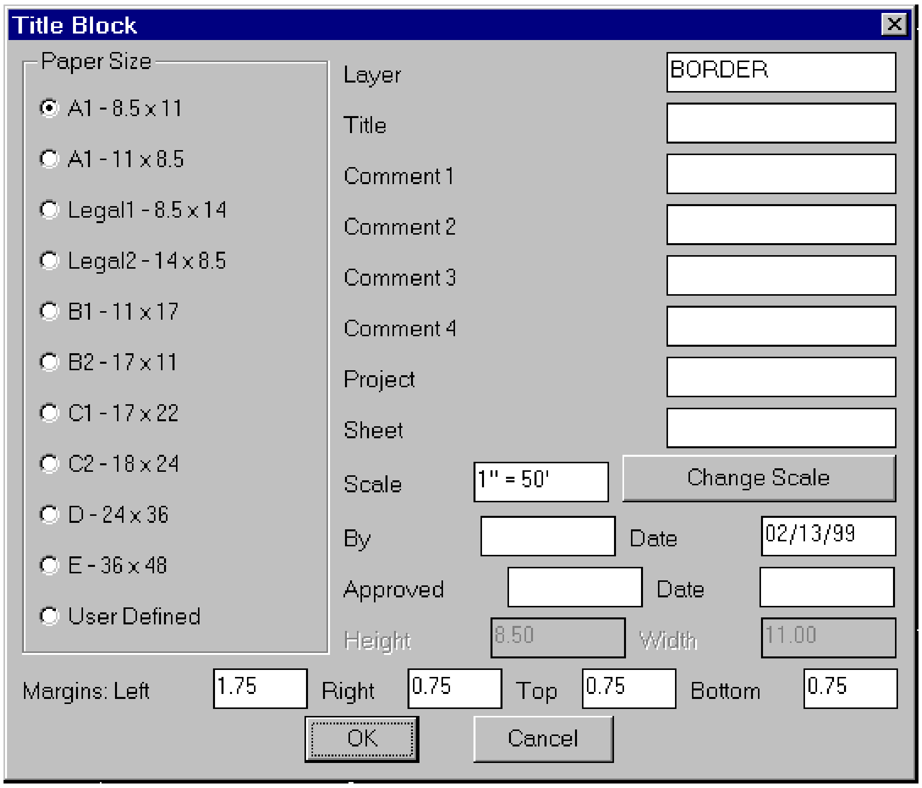
This command draws a border and title block for the selected sheet size. The margins to useare specified at the bottom of the dialog. Margins are needed so that the border fits in theplotter's plotable area. For sheet 11x17 or smaller, a 1/2 inch margin is typical. For larger sheets, atypical margin is 3/4 inch. The *LIMITS* of the drawing can be set to the lower left and upper rightcorners of the border. To change the title block, edit the drawing TBLOCK.DWG in the \SUP directory.Click the toggle User Defined to set a custom sheet size. The default user defined size can be storedin the Configure TakOff command under the General Settings option. After the title blockis drawn, the contents can be edited using the Attribute Edit command under the Modify menu.The Change Scale button will change the scale for the title block and for the drawing.

Function (AutoCAD R2000 and up)

This command draws a border and title block for the selected sheet size. At the top of thedialog, choose your horizontal scale and sheet size. The ∗other∗ choice at the bottom of each list willallow you to add your own scale or size if yours is not listed. Anything added to these lists will beretained for future use. Next, choose either "landscape" or "portrait" format. A blue rectangle next tothis choice shows you the difference. Below this, you can choose what layer to draw the borderand title block on. The margins to use are specified next at the bottom of the dialog. On the righthand side of the dialog. you can choose from several title blocks. As you choose each one, apreview will be shown below this list. This routine looks for all drawings named "tblock" in the\SUP directory. If you want to add your own title block, simply create a new drawing (or copy anexisting one) in the \SUP directory and give it a name that starts with tblock. Example: tblock22.dwgand tblock-Jones.dwg are both valid names for this routine, but "MyTitleblk.dwg" is not. Afteryou have made all your decisions in the dialog box, press OK. Depending on your current zoomlevel, your drawing may be zoomed out to allow you to see the entire area that will be covered bythe drawing border. At this point, you have the border attached to your cursor and itis waiting for you to pick a point for insertion. As soon as you do this, a secondarydialog will appear for you to fill out theattributes associated with the particular title blockyou selected.

Prerequisite: set horizontal scale in Drawing Setup

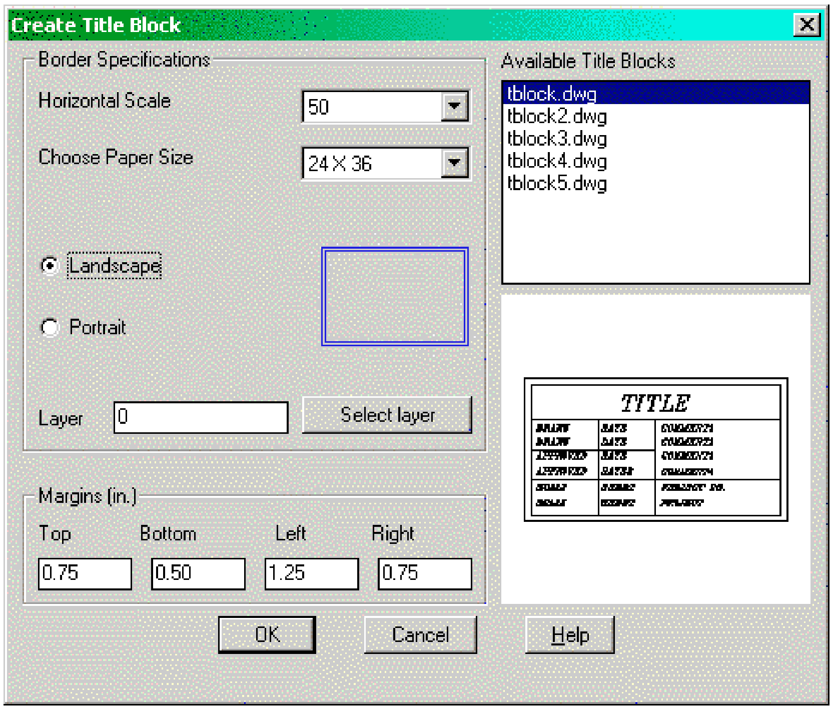
Keyboard Command: tblock



Paper Size
● A1 - 8.5 x 11
○ A1 - 11 x 8.5
○ Legal1 - 8.5 x 14
○ Legal2 - 14 x 8.5
○ B1 - 11 x 17
○ B2 - 17 x 11
○ C1 - 17 x 22
○ C2 - 18 x 24
○ D - 24 x 36
○ E - 36 x 48
○ User Defined

Layer: BORDER
Title:
Comment 1:
Comment 2:
Comment 3:
Comment 4:
Project:
Sheet:
Scale: 1" = 50'
By:
Date: 02/13/99
Approved:
Date:
Height: 8.50
Width: 11.00
Margins: Left 1.75 Right 0.75 Top 0.75 Bottom 0.75

Title Block Dialog for R14



Border Specifications
Horizontal Scale: 50
Choose Paper Size: 24 X 36
● Landscape
○ Portrait
Layer: 0

Available Title Blocks
tblock.dwg
tblock2.dwg
tblock3.dwg
tblock4.dwg
tblock5.dwg

Margins (in.)
Top: 0.75
Bottom: 0.50
Left: 1.25
Right: 0.75

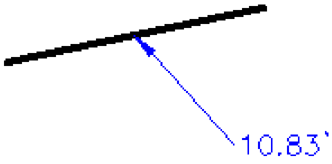
Title Block Dialog for R2000 & up>

Distance with Leader

This command labels the distance of a line or polyline segment at a point then draws a user specified leader line to point to the defining line. There is the ability for multi-segment leaders, and the option to align the label horizontal to the current view or parallel to the linework.

Prompts

Define distance by, Points/<Select line or polyline>: *select a line*
Pick point to start leader: *pick a point near the line*
Label Position: *pick a point*
Define distance by, Points/<select line or polyline>: *press Enter to end*



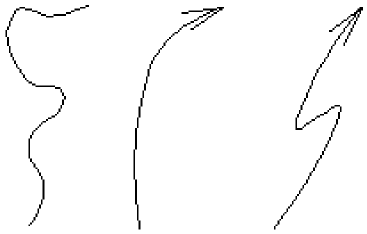
Keyboard Command: distlead
Prerequisite: None

Curve - Arrow

Curve - Arrow can be used to draw a section of contour line or create leader pointer lines. Curve - Arrow draws a Bezier curve through user specified points. After choosing endpoints, each time an intermediate points is picked the curve will be redrawn through all the points. There is an option to draw an arrowhead at the starting point. The arrowhead size is determined by the CAD system variable "DIMASZ". In order to change this size, type DIMASZ at the command prompt. This routine also has a Zorro option which creates a Z leader curve.

Prompts

Create a Zorro (Yes/<No>)? *N*
Include an arrow (Yes/<No>)? *Y*
Enter the arrow head size <4.00>: *press Enter* This defaults to the DIMASZ system variable.
Pick a starting point: *pick a point*
Pick an ending point: *pick a point*
Pick an intermediate point (U to Undo): *pick a point*
Pick an intermediate point (U to Undo): *press Enter*

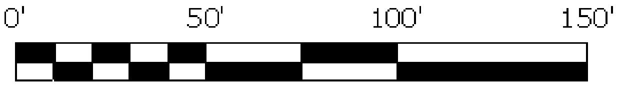


Examples of Curve - Arrow

Pulldown Menu Location: Draw
Keyboard Command: carrow
Prerequisite: None

Barscale

This command draws a barscale. You will be prompted for the horizontal scale. The default value is set in the Drawing Setup command in the Settings menu.



Prompts

1 Insertion Point: **pick a point**

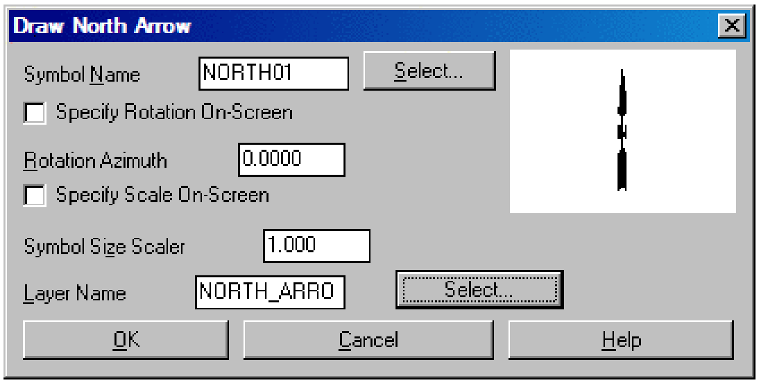
2 Horizontal scale <50.0>: **Press Enter**

Prerequisite: None

Keyboard Command: BARSCALE

North Arrow

This command inserts a north arrow symbol. You can select from several styles of arrows, and you can add your own by using the *Edit Symbol Library* command on the Settings menu.



Symbol Name: NORTH01

☐ Specify Rotation On-Screen

Rotation Azimuth: 0.0000

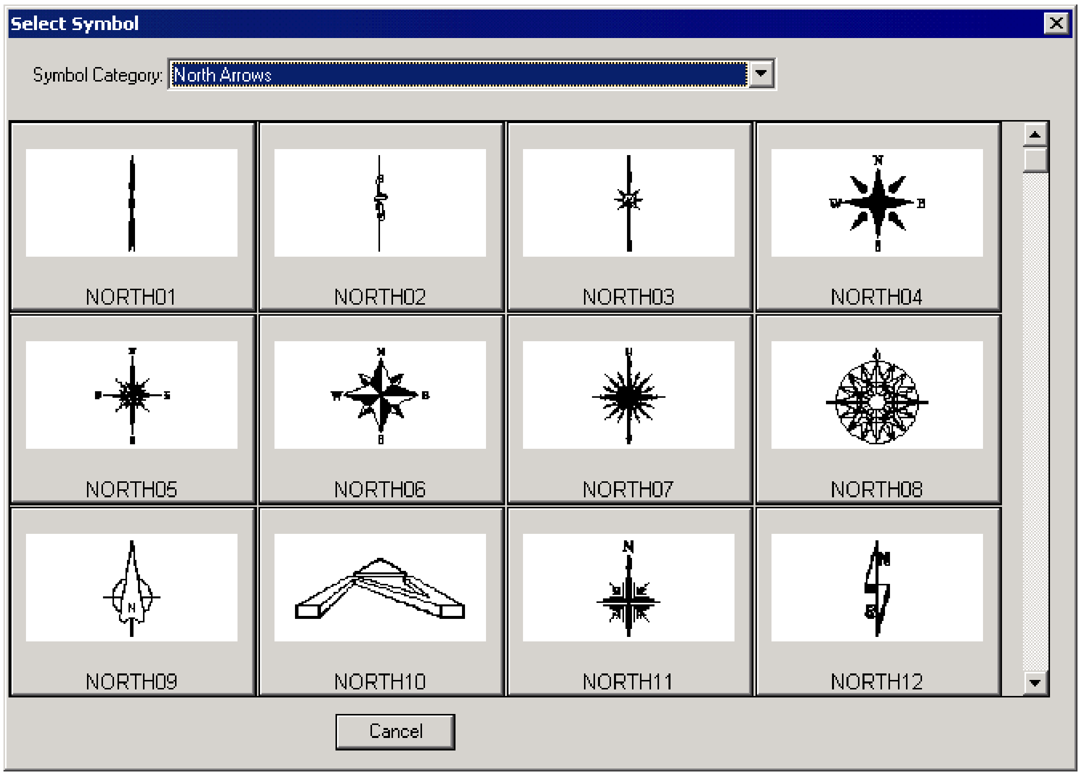
☐ Specify Scale On-Screen

Symbol Size Scaler: 1.000

Layer Name: NORTH_ARRO

Prompts

Draw North Arrow Dialog *choose an arrow symbol, layer and other variables*
Specify insertion point: *pick a point*


Select Symbol
Symbol Category:
North Arrows
NORTH01
NORTH02
NORTH03
NORTH04
NORTH05
NORTH06
NORTH07
NORTH08
NORTH09
NORTH10
NORTH11
NORTH12
Cancel

Keyboard Command: narrow
Prerequisite: None

Digitize Menu

6

Tablet On

Executes AutoCad's TABLET command to set the tablet on. Refer to the AutoCad Reference manual for further information.

Note: Function key [F4] can toggle on/off tablet.

Keyboard Command: tablet
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up.

Tablet Off

Executes AutoCad's TABLET command to set the tablet on. Refer to the AutoCad Reference manual for further information.

Note: Function key [F4] can toggle on/off tablet.

Keyboard Command: tablet
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up.

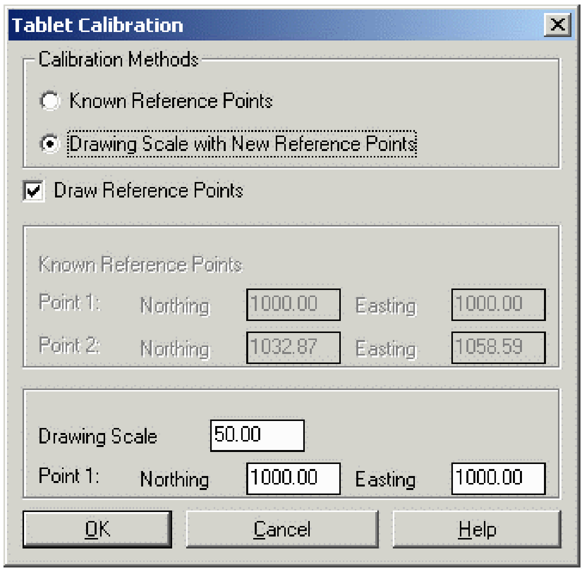
Tablet Calibrate

You can calibrate the tablet/digitizer in one of two ways: **Known Reference Points** or **Drawing Scale with New Reference Points**. Reference points are the foundations of whatever data you digitize into the computer. Takeoff bases everything from drawing location to drawing scale on the reference points you digitize.

Drawing Scale with New Reference Points method is very convenient when you don't know the precise coordinates of the entities on your drawing. As long as your can obtain the drawing scale from your plan, this method can establish a coordinate system relative to the position of the plan on the digitizer board. In addition to the drawing scale, you are required to enter a random coordinate for the first reference point, the default coordinate is (1000,1000). Takeoff would computer the coordinate of the second reference point that you pick based on the first point. The coordinates of these two reference points would be saved and will be display on the **Tablet Calibration Dialog** next time when you calibrate the tablet, so you can digitize back to the previous coordinates using **Know Reference Points** method if you are working on the same drawing, though you might have moved or rotated your drawing on the digitize board..

If you know the precise coordinates of two points, you can select **Known Reference Points** method, which establishes a coordinate system that is exactly match the coordinates in the field or on your drawing. Furthermore, Takeoff saves the coordinates of the two reference points from previous calibration and displays them on the **Tablet Calibration Dialog** next time when you calibrate the tablet. If you want to continue to work on the same drawing, you can use the **Know Reference Points** method with the saved coordinates to digitize back to your previous coordinates although you might have moved or rotated your drawing on the digitizer board.

For accurate takeoff calculations, choose two points that can be easily found in the field and are farther apart rather than closer together.



Tablet Calibration

Calibration Methods

○ Known Reference Points

● Drawing Scale with New Reference Points

☑ Draw Reference Points

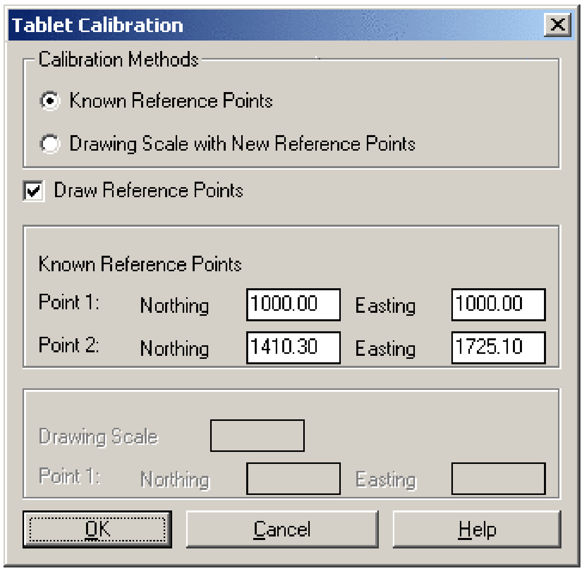
Known Reference Points

Point 1: Northing 1000.00 Easting 1000.00

Point 2: Northing 1032.87 Easting 1058.59

Drawing Scale 50.00

Point 1: Northing 1000.00 Easting 1000.00



Tablet Calibration

Calibration Methods

● Known Reference Points

○ Drawing Scale with New Reference Points

☑ Draw Reference Points

Known Reference Points

Point 1: Northing 1000.00 Easting 1000.00

Point 2: Northing 1410.30 Easting 1725.10

Drawing Scale

Point 1: Northing Easting

Prompts

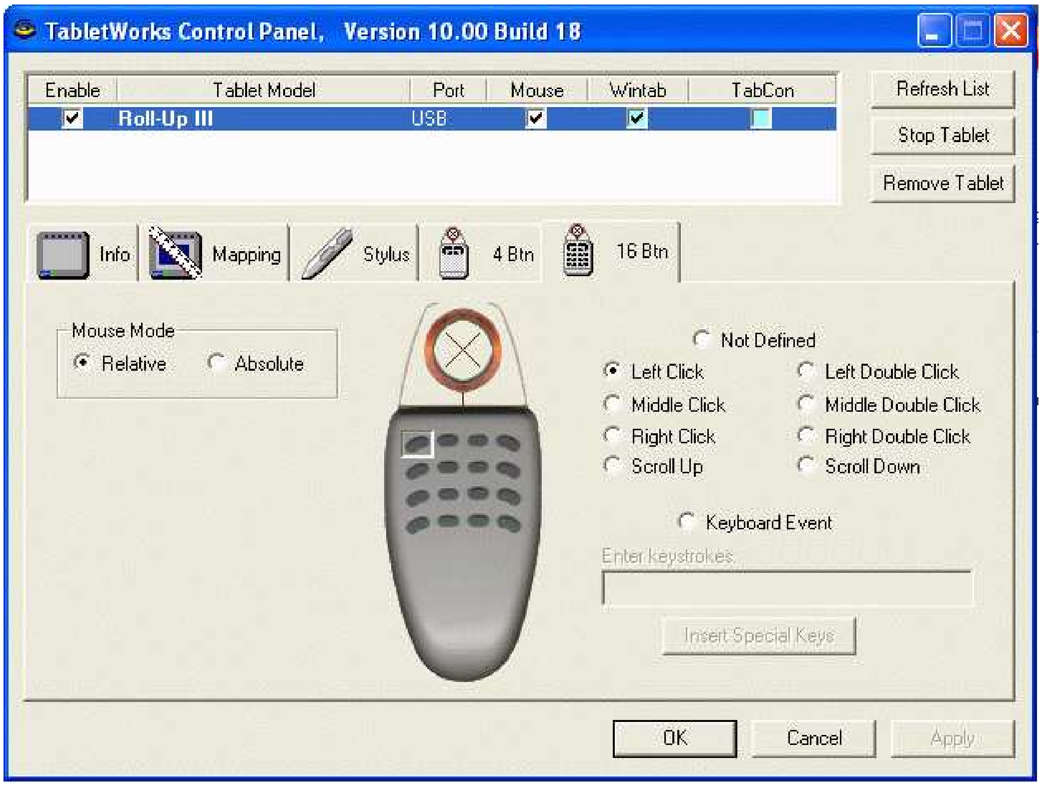
Tablet Calibration Dialog
Specify the Calibration Methods. If you select Drawing Scale method, enter the drawing scale and the coordinate of the first reference point. Otherwise enter the exact coordinates of the first and second reference points.
Pick first reference point:*pick a point on the drawing*
Pick second reference point:*pick another point on the drawing*

Keyboard Command: digsetup
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up.

Digitizer Setup

Digitizing is the act of inputting data into the computer by tracing the data from a plan sheet. You need to have a digitizer board, puck, Carlson Takeoff, your computer and your plan to do digitizing. Wintab is a digitizer driver that lets you to use the digitizer cursor as both a digitizer cursor and a mouse. You need to install Wintab when you install Carlson Takeoff. Wintab can be downloaded from GTCO web site: http://www.gtcocalcomp.com/supportgtcosoftware.htm. Select the driver version that suits the type of your digitizer board well.

After you installed Wintab driver on your computer, you set up you digitizer to the correct point mode. In Windows 2000/XP, go to **Start->Settings->Control Panel->TabletWorks**, high light the **16-Btn Cursor**, and select **Mouse** as the **Pointing Mode**, which lets the digitizer cursor moves relatively to the screen coordinates. This step is indicated in the following **TabletWorks Control Panel** dialog.



TabletWorks Control Panel, Version 10.00 Build 18

Enable	Tablet Model	Port	Mouse	Wintab	TabCon
☑	Roll-Up III	USB	☑	☑	☐

Mouse Mode

● Relative ○ Absolute

○ Not Defined

● Left Click ○ Left Double Click

○ Middle Click ○ Middle Double Click

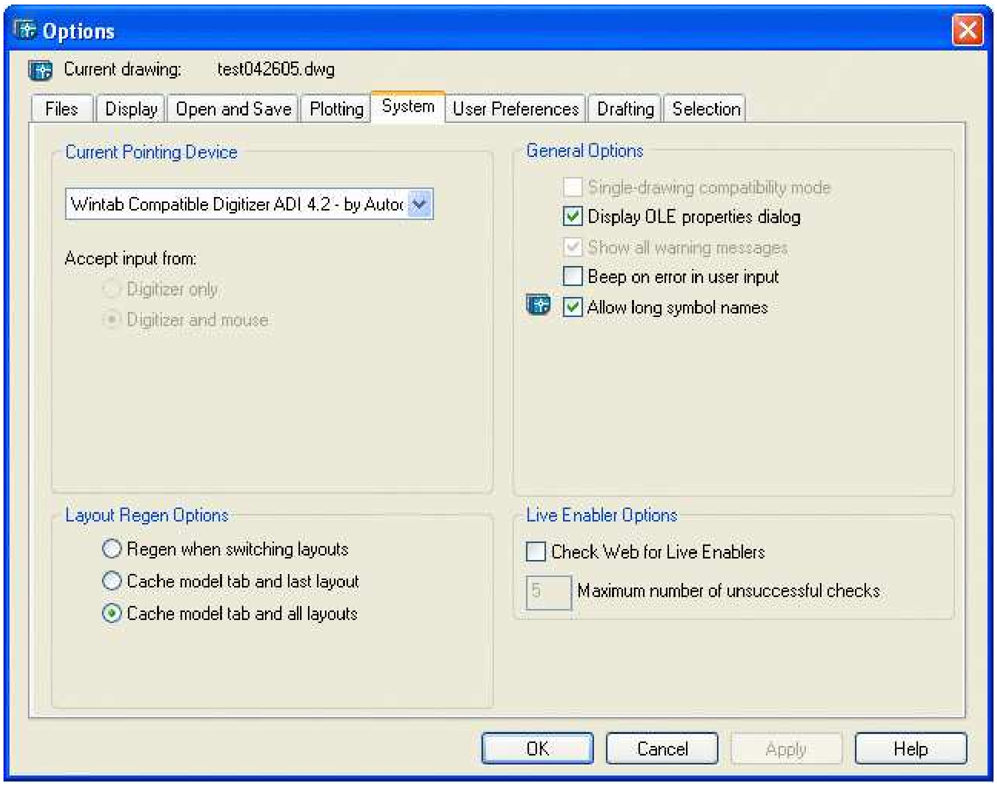
○ Right Click ○ Right Double Click

○ Scroll Up ○ Scroll Down

○ Keyboard Event

Enter keystrokes:

The next is to set up the pointing device in Carlson Takeoff. Open up Takeoff and go to pull-down **Settings->Preferences**, click tab **System**, select **Wintab Compatible Digitizer** as **Current Pointing Device**, and set the **Accept input from** to **Digitize and mouse**. Please refer to the following **Options** dialog.



Current drawing: test042605.dwg

Current Pointing Device

Wintab Compatible Digitizer ADI 4.2 - by Autoc

Accept input from:

○ Digitizer only

● Digitizer and mouse

General Options

☐ Single-drawing compatibility mode

☑ Display OLE properties dialog

☑ Show all warning messages

☐ Beep on error in user input

☑ Allow long symbol names

Layout Regen Options

○ Regen when switching layouts

○ Cache model tab and last layout

● Cache model tab and all layouts

Live Enabler Options

☐ Check Web for Live Enablers

5 Maximum number of unsuccessful checks

Now, you are ready to use your digitizer. On the bottom of the screen, there is a tray icon TABLET on the right side of MODEL. You can use accelerator key **F4** to toggle on/off the tablet.

Save Tablet Calibration

This command saves current tablet calibration to a file. You are prompted to enter a file name.

Keyboard Command: tablet1
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.

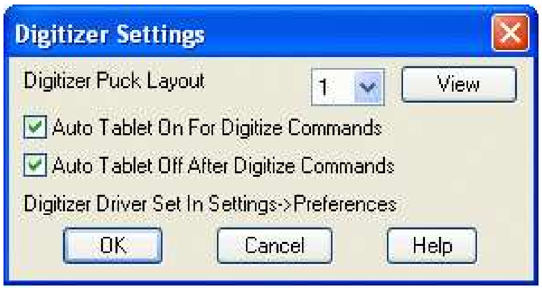
Load Tablet Calibration

This command restores the tablet calibration parameters from a file and load it into the current drawing. You are prompted to specify a file name.

Keyboard Command: tablet2
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. The calibration file should be associated to the current drawing, and the current drawing shouldn't have been moved on the digitizer board since last calibration.

Digitizer Settings

This command allows you to select the puck layout and set Auto On/Off features.


Digitizer Settings
Digitizer Puck Layout
1
View
☑ Auto Tablet On For Digitize Commands
☑ Auto Tablet Off After Digitize Commands
Digitizer Driver Set In Settings->Preferences
OK
Cancel
Help

Auto Tablet On For Digitize Commands means after you select a digitize command your puck will automatically be put in Digitize Mode. If this is toggle off, then you will need to turn Tablet on separately from running a digitize command.

Auto Tablet Off After Digitize Commands means you will return to Mouse Mode after running a digitize command. Read below for more on Mouse and Digitize Mode.

Puck Layout

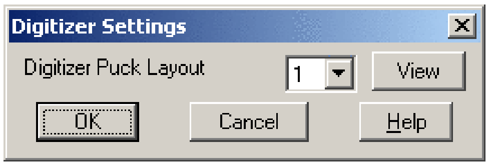
The 16-button puck can be used as either a mouse or a digitizer. It's very important to understand how the 16 buttons are mapped in both modes.

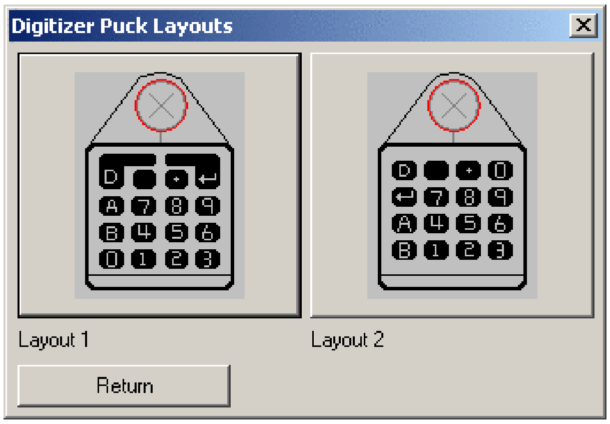
Mouse Mode

When the tablet is off, the puck is in Mouse Mode. The top-left button is the left mouse click, and the top-right button is the right mouse click. The labels on the other buttons do not mean anything. All buttons are mapped as same as the buttons of the default pointing device in AutoCad . Please refer to AutoCad Reference manual for further information.

Digitize Mode

When tablet has been calibrated and is on, the puck is in digitize mode. It is mapped as a small keyboard, which enables you to enter numerous values such as elevation, thickness and offset etc., and also provide you some functionality to digitize various entities. Currently there are two puck layouts in Takeoff, shown in the figure below. After you install Carlson Takeoff and finish setting up the digitizer, you go to the pull-down menu **Digitize->Puck Layout** to select a 16-button puck layout. A button mapping would be created and Takeoff would recognize the buttons as represented.


Digitizer Settings
Digitizer Puck Layout
1
View
OK
Cancel
Help



Layout 1 is Carlson Puck Layout, which is the most common layout used in Carlson Takeoff. Layout 2 is for users who don't have a Carlson Puck. If your puck is different than these two layouts, please contact Technical Support for help setting the mapping for your 16 button puck.

Prompts

Digitizer Settings Dialog
Specify the Digitizer Puck Layout to layout 1 or 2

Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed.
Keyboard Command: dig_config

Digitize Existing

This sets the layer target to existing. Set this prior to running any digitizing command and anything you digitize will be assigned for your existing surface. Checkout the Define Layer Target/Material/Subgrade command under Tools for more on targets.

Keyboard Command: set_digit_exist
Prerequisite: none

Digitize Design

This sets the layer target to design. Set this prior to running any digitizing command and anything you digitize will be assigned for your design surface. Checkout the Define Layer Target/Material/Subgrade command under Tools for more on targets.

Prerequisite: none
Keyboard Command: set_digit_final

Digitize Other

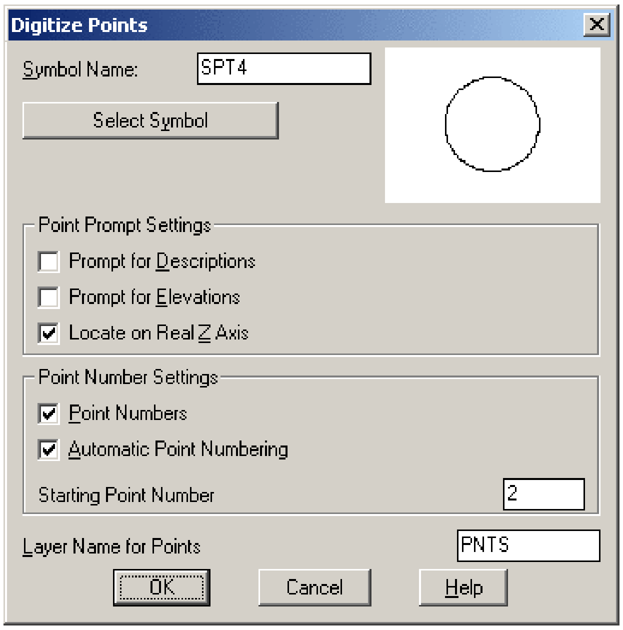
This sets the layer target to other. Set this prior to running any digitizing command and anything you digitize will be assigned to the Other target. Checkout the Define Layer Target/Material/Subgrade command under Tools for more on targets.

Keyboard Command: set_digit_other

Prerequisite: none

Digitize Point

This command allows you to digitize individual points one at a time. The first time it prompts you the **Digitize Points Dialog** for entering point symbol styles, point prompt settings and number settings, starting point number and layer name. If you want to enter the elevation and description for each point, select **Prompt for Descriptions** and **Prompt for Elevations**. After having digitized a point, you can continue to digitize next point by picking the point on the drawing. The command defaults to the last layer name, point symbol, elevation, description and the last point number plus 1. If you have finished digitizing points, press **Enter** to finish.



Digitize Points

Symbol Name: SPT4

Point Prompt Settings

☐ Prompt for Descriptions

☐ Prompt for Elevations

☑ Locate on Real Z Axis

Point Number Settings

☑ Point Numbers

☑ Automatic Point Numbering

Starting Point Number 2

Layer Name for Points PNTS

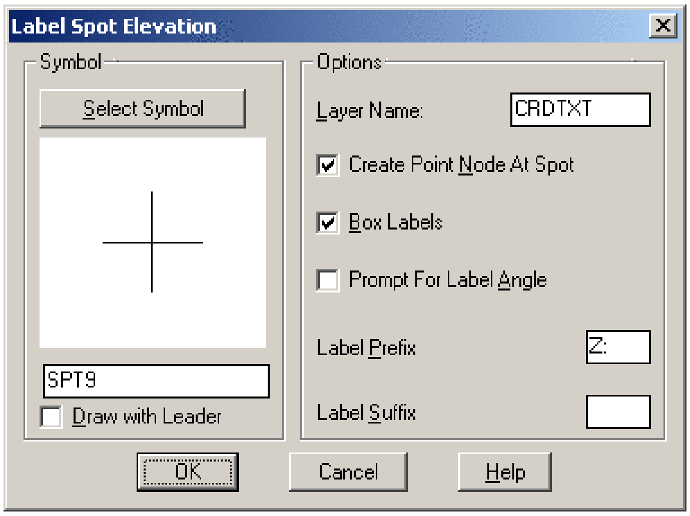
Prompts

Digitize Points Dialog
Specify a layer name and select the point symbol, point prompt settings and number settings.
Pick point to create (Enter to end): *pick a point on the drawing*
Select/<Enter Point Elevation <>>:*enter the elevation or type <Select> to select the elevation text on the screen*
Enter Point Description <>:*enter the point description*
Result like "N: 1231.16 E: 1099.17 Z: 30.00" would be display on the command line, and a point would be drawn on the screen with the text of its number, elevation and description.
Pick point to create (Enter to end):*pick next point or press Enter to finish digitizing points*

Keyboard Command: dig_pt
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.

Digitize Spot Elevation

This command allows you to label points with their elevation. The point can either be digitized from a drawing, picked on a screen or specified by a point number. The command first prompts you the **Label Spot Elevation Dialog** for entering layer name, label prefix and suffix and symbol types etc. Click OK to start. After specifying the point, the command prompts you to enter the elevation if its elevation is unknown and then pick an angle from the location of the point to label the elevation. You can repeat labeling points until you press **Enter** to finish.



Layer Name: CRDTXT
☑ Create Point Node At Spot
☑ Box Labels
☐ Prompt For Label Angle
Label Prefix Z:
Label Suffix
SPT9
☐ Draw with Leader

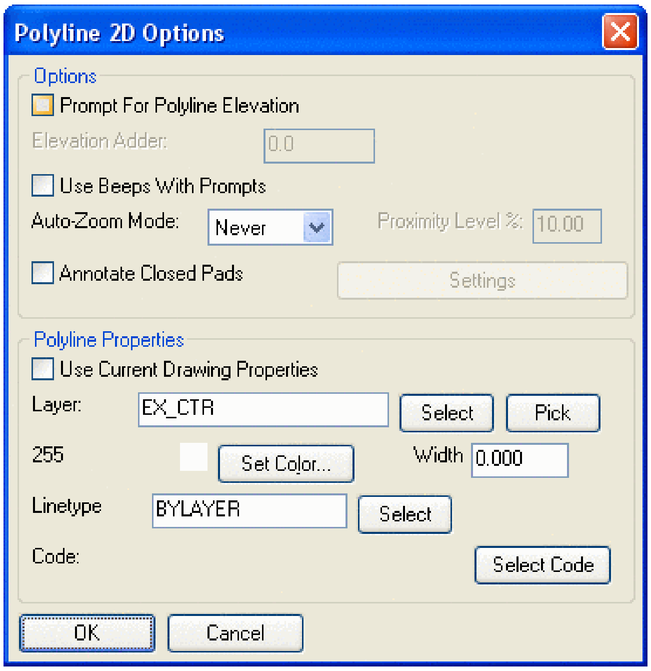
Prompts

Label Spot Elevation Dialog
Specify a layer name, label prefix and suffix and select the spot symbol.
Point to Label ?
Pick point or point number: 2 *(enter a point number)*
PointNo. Northing(Y) Easting(X) Elev(Z) Description
2 1231.16 1099.17 30.00 bb
Note: if the point number you entered is not in the drawing, you will be prompted again to pick point or enter a point number.
Elevation <30.000>: *press enter*
Pick angle for label: *pick an angle from the spot*
Point to Label (ENTER to End)?
Pick point or point number: *pick a point on the drawing*
Elevation <0.000>: *enter elevation*
Pick angle for label: *pick an angle from the spot*
Point to Label (ENTER to End)?
Pick point or point number: *press enter to finish*

Keyboard Command: labspot
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.

Digitize 2D Polyline

A 2D polyline is a line of connected points that have the same elevation. This command lets you digitize a 2D polyline by picking points along the lines on the drawing. It prompts you first the **Polyline 2D Options Dialog** for entering the layer name. **Prompt For Polyline Elevation** option allows you to enter the elevation for each polyline, otherwise all 2D polylines have 0.0 elevation. **Auto-Zoom** mode would automatically zoom the display to center around the last point when you get near the edge of the screen while picking points. There are three ways to enter a layer name, **Use current drawing layer**, **Select** from a list of layer name, or **Pick** an entity on the screen to get its layer name. While digitizing a polyline, the command keeps prompting you to either pick the next point or **press 0** to create an Arc until your **press Enter** to finish digitizing. **Press A** on the puck or **enter Close** on the keyboard to close the polyline on itself. You can define **an Arc** by Radius, Arc length, Chord length, Delta angle, or by simply picking 3 points along the arc. If at any point you make a mistake, **press B** on the puck or **enter Undo** on the keyboard to remove the mistake and then continue to digitize. After finishing a polyline, the command prompts you to digitize another polyline until you **press B** or **enter No**.


Polyline 2D Options

Options

☐ Prompt For Polyline Elevation

Elevation Adder: 0.0

☐ Use Beeps With Prompts

Auto-Zoom Mode: Never

Proximity Level %: 10.00

☐ Annotate Closed Pads

Polyline Properties

☐ Use Current Drawing Properties

Layer: EX_CTR

255

Width 0.000

Linetype BYLAYER

Code:

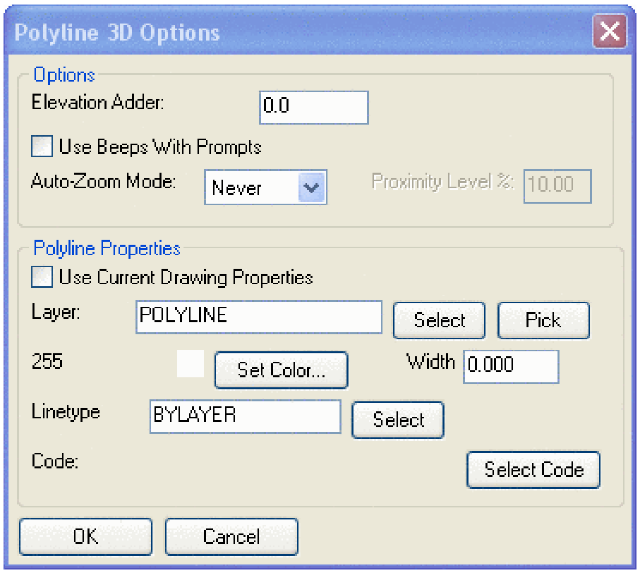
Prompts

Polyline 2D Options Dialog
Enter the layer name and select the options of Prompt For Polyline Elevation and Auto-Zoom mode etc.
Enter default elevation <0.00>: *100*
First point: *pick a point on the drawing using puck*
Segment length: 0.00, Total length: 0.00
Arc[0]/Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick next point*
Segment length: 119.03, Total length: 119.03
Arc[0]/Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick next point*
Segment length: 115.23, Total length: 234.26
Arc[0]/Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *press 0*
[Radius[0]/Second pt[A]/Undo[B]/<Pick Endpoint>]: *press A*
Second point or point number: *pick a point along the arc*
Endpoint or point number: *pick the last point along the arc*
Segment length: 500.82, Total length: 735.08
Arc[0]/Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick next point*
Segment length: 115.23, Total length: 850.31
Close[A]/Undo[B]/Pick next point (Enter to end): *press enter to finish digitizing or press A to close the polyline*
Digitize Another FINAL Polyline [Yes(A)/<No(B)>]? *press A on the puck or enter Yes on the keyboard to digitize next 2D polyline, press B on the puck or enter No on the keyboard to finish digitizing 2D polyline.*

Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.
Keyboard Command: dig_2dp

Digitize 3D Polyline

A 3D polyline is a line of connected points that have various elevations, and the slope between points is constant. It can be used in defining pads, excavations, drainage ditched and slopes from proposed design features to meet existing site conditions. This command lets you digitize a 3D polyline by picking points along the lines on the drawing. It prompts you first the **Polyline 3D Options Dialog** for entering the layer name. **Elevation Adder** allows you to truncate the elevations you have to enter in by add a given amount to them. There are five ways to enter elevations: known elevation of the point, interpolate, slope from previous point, ratio from previous point and degree from previous point. You can choose one of the methods between picking points. **Auto-Zoom** mode would automatically zoom the display to center around the last point when you get near the edge of the screen while picking points. While digitizing a polyline, press A to interpolate the elevation or B to enter it in. The command keeps prompting you to either pick the next point or **press 0** to create Arc cords until you **press Enter** to finish digitizing. **Press A** on the puck or **enter Close** on the keyboard to close the polyline on itself. You can define **Arc cords** by Radius, Arc length, Chord length, Delta angle, or by simply picking 3 points along the arc. You can also use the OSNAP command to pick points by pressing the decimal [.] button on the digitizer puck. If you make a mistake, **press B** on the puck or **enter Undo** on the keyboard to remove the mistake and then continue to digitize. After finishing a polyline, the command prompts your to digitize another polyline until you **press B** or **enter No**.



Polyline 3D Options

Options

Elevation Adder: 0.0

☐ Use Beeps With Prompts

Auto-Zoom Mode: Never

Proximity Level %: 10.00

Polyline Properties

☐ Use Current Drawing Properties

Layer: POLYLINE

255

Width 0.000

Linetype BYLAYER

Code:

Prompts

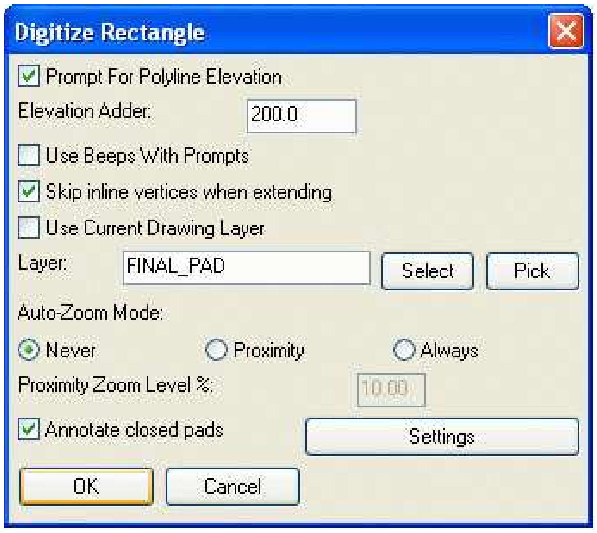
First point:
Interpolate[A]/screen Pick/<Elevation[B]> <0.00>: 256
Z: 256.00
Arc[0]Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): Pick point
Slope/Ratio/Interpolate[A]/Degree/screen Pick/<Elevation[B]> <256.00>: A
Slope/Ratio/Elevation[B]/Degree/screen Pick/Osnap[.]/Next point or elevation<Interpolate>: Pick point
This point elevation will be interpolated upon completion.
Slope/Ratio/Elevation[B]/Degree/screen Pick/Osnap[.]/Next point or elevation<Interpolate>: 279
Z: 279.00, Hz dist: 30.01, Slope dist: 37.81, Slope: 76.6% Ratio: 1.3:1

Arc[0]Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): Pick point
Slope/Ratio/Elevation[B]/Degree/screen Pick/Osnap[.]/Next point or elevation<Interpolate>: Press Enter
Z: 279.00, Hz dist: 24.18, Slope dist: 24.18, Slope: 0.0% Ratio: 0.0:1
Arc[0]Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): A
Digitize Another EXIST_PLINE Polyline [Yes(A)/<No(B)>]? B
<Tablet Off>

Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.
Keyboard Command: dig_3dp

Digitize Rectangle

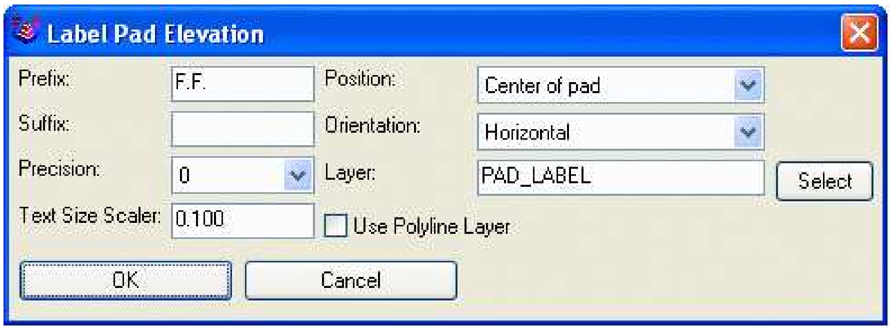
This command enables you to quickly create rectangles while digitizing. In the dialog, you can pick to set elevations to the rectangles, otherwise all rectangles will have 0.0 elevation. The Elevation Adder will be added to the value you enter in for the prompt "Enter polyline elevation <0.00>:". For example, if you know all the rectangles you are creating are in the 200s for elevation, you can put in this value for the Elevation Adder and simply put 46, 54, 57, etc. when prompted, and your rectangles will end up with the elevations of 246, 254, 257 etc. There are three ways to enter a layer name, Use current drawing layer, Select from a list of layer name, or Pick an entity on the screen to get its layer name. Auto-Zoom mode would automatically zoom the display to center around the last point when you get near the edge of the screen while picking points.



Digitize Rectangle

☑ Prompt For Polyline Elevation
Elevation Adder: 200.0
☐ Use Beeps With Prompts
☑ Skip inline vertices when extending
☐ Use Current Drawing Layer
Layer: FINAL_PAD
Auto-Zoom Mode:
● Never ○ Proximity ○ Always
Proximity Zoom Level %: 10.00
☑ Annotate closed pads

Annotate closed pads will label your rectangles according to the Settings button/dialog shown below:



Label Pad Elevation

Prefix: F.F.
Suffix:
Precision: 0
Text Size Scaler: 0.100
Position: Center of pad
Orientation: Horizontal
Layer: PAD_LABEL
☐ Use Polyline Layer

In this dialog, you can enter in a Prefix or a Suffix to the elevation, and determine the labels position, orientation, precision out to 5 decimal places, its layer, and text size.

Prompts

Target surface: Design
Digitize Rectangle Dialog Make any chances you desire in the above dialogs.
Enter polyline elevation <0.00>: *200*
First point: *pick a point on the drawing using puck*
Segment length: 0.00, Total length: 0.00
Close[A]/Undo[B]/Osnap[.]/Pick next point: *pick next point*
Segment length: 1105.96, Total length: 1105.96
Close[A]/Undo[B]/Osnap[.]/Pick next point: *pick next point*
Segment length: 426.83, Total length: 1532.79, Area: 236021.59
Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *After 3 points you can press (A) for Close to create a rectangle*
Digitize Another FINAL_PAD Polyline [Yes(A)/<No(B)>]? *B for No*

Prerequisite: a digitizer
Keyboard Command: DIG_RECT

Digitize Perimeter

Perimeter is a 2D polyline that all points on it have the same elevation. It can be used as boundary polyline of your targets on your drawing. This command allows you to digitize a perimeter by picking points on the drawing. While digitizing a polyline, the command keeps prompting you to pick next point until your **press Enter** to finish digitizing, or **press A** on the puck or **enter Close** on the keyboard to close the polyline on itself . If you make a mistake, **press B** on the puck or **enter Undo** on the keyboard to remove the mistake and then continue to digitize. After finishing a perimeter, the command prompts your to digitize another polyline until you **press B** or **enter No**.

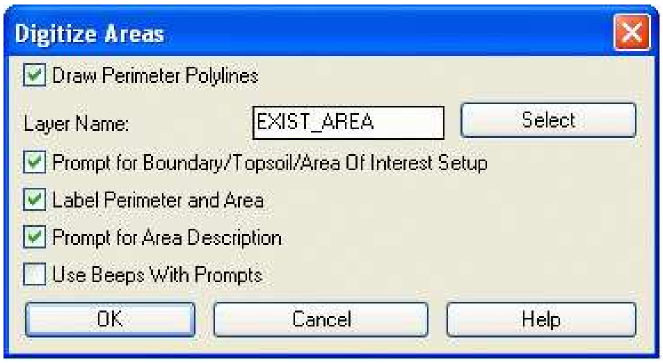
Prompts

First point: *pick a point on the drawing using puck*
Segment length: 0.00, Total length: 0.00
Close[A]/Undo[B]/Pick next point (Enter to end): *pick next point*
Segment length: 104.27, Total length: 104.27
Close[A]/Undo[B]/Pick next point (Enter to end): *pick next point*
Segment length: 153.14, Total length: 257.41
Close[A]/Undo[B]/Pick next point (Enter to end): *pick next point*
Segment length: 104.89, Total length: 362.30
Close[A]/Undo[B]/Pick next point (Enter to end): *press Enter to finish the perimeter, or press A to close the perimeter*
Digitize Another PERIMETER Polyline [Yes(A)/<No(B)>]? *press A or enter Yes to continue digitizing another perimeter, press B or enter No to finish digitizing perimeters.*

Keyboard Command: dig_perim
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.

Digitize Areas

This command allows you to find an area in digitize mode. With the puck, pick around the area you wish to calculate. If Draw Perimeter Polyline is toggled on then the linework of your perimeter will be displayed. You can then set the Layer Name and choose to label the Perimeter and Area and enter in an Area Description. You can also set the area you created as a Boundary, Topsoil, or Area of Interest.



☑ Draw Perimeter Polylines
Layer Name: EXIST_AREA

☑ Prompt for Boundary/Topsoil/Area Of Interest Setup
☑ Label Perimeter and Area
☑ Prompt for Area Description
☐ Use Beeps With Prompts

Prerequisite: a digitizer
Keyboard Command: dig_area

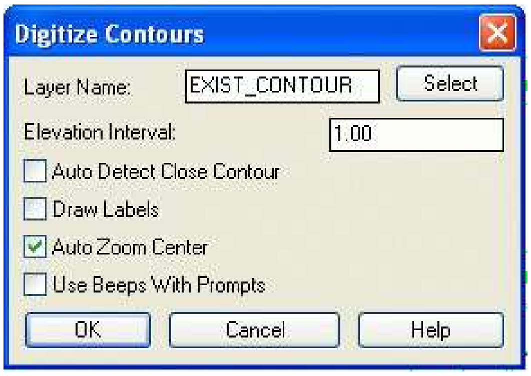
Digitize Contour Polyline

A contour is a line of points with a constant elevation, representing the natural contour of the site. In Takeoff, there are two layer targets: Existing Ground Surface and Design Surface. Contour Polyline has two sub-command to digitize contour lines into Existing Contour and Final Contour layers directly for assigning them easily into Existing Ground Surface and Design Surface in the future analysis.

There are two ways to digitize contour lines: sketch mode or point mode. You can start digitizing a contour with one mode and switch to the other during digitizing the contour. Sketch mode uses more points than pick mode. In general, we recommend using pick mode to digitize the straight parts of lines because it reduces the number of points and speeds up Takeoff's calculations, but using sketch mode to digitize the curved parts because it is fast and accurate.

This command lets you digitize contours as polylines one at a time. The first time it prompts you the Digitize Contours Dialog. Enter the layer name or select it from a list of existing layer. Look at your plans and determine an elevation interval that is between most of the contours and enter it in the Elevation Interval field. You are able to modify both the value and the direction of the elevation interval between digitizing contour lines, using the buttons on the puck. To have Takeoff automatically close contours whose beginning and ending points are within a specified range, check the Auto Detect Close Contour. Draw Labels would draw the elevation at the starting point of the contour. In Pick mode, if you want the Takeoff to automatically zoom the display to center around the last point when you get near the edge of the screen while picking points, check the Auto Zoom Center. Click OK to start digitizing.

If this is your first time digitizing a contour, you are defaulted to the Pick Mode digitizing, otherwise you would be defaulted to the last digitize mode. If you want to use the other digitize mode, press 0 on the puck or enter 0 from the keyboard. Place your cursor at one end of the contour line and begin digitizing the line. While digitizing a line, you can force a contour to close on itself by pressing A on the puck to end the contour and connect the last point to the first point, remove a mistake by pressing B on the puck, or switch to the other digitize mode by pressing 0. During Sketch Mode digitizing, you can stop digitizing by pressing Pick or Enter button on the puck, take some rest or changes, and start sketching again. At the end of the contour line, **press Enter** on your puck or keyboard. The contour is completed, and the elevation for the next contour is automatically incremented. You would be asked to digitize next contour. If you press A on the puck or enter Yes on the keyboard, you can digitize another contour, or press B on the puck or enter No on the keyboard to finish digitizing contours.



Layer Name: EXIST_CONTOUR

Elevation Interval: 1.00

☐ Auto Detect Close Contour

☐ Draw Labels

☑ Auto Zoom Center

☐ Use Beeps With Prompts

Prompts

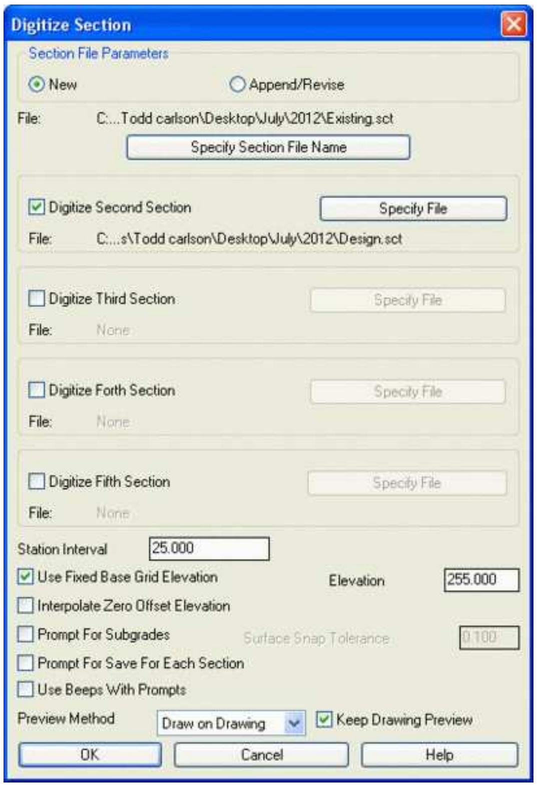
Digitize Contours Dialog
Enter Layer Name, Elevation Interval, and toggle on/off Auto Detect Close Contour etc.
Increment(1.00)[A]/Direction(+)[B]/Elevation <573.00>: 450 *(enter elevation or press Enter to accept current value)*
Start Digitizing...
Sketch[0]/Pick the first point: *pick a point to start Pick Mode digitizing (press 0 to switch to Sketch Mode)*
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): pick next point
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): pick next point
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): 0 (press 0 on the puck or enter 0 on the keyboard to use Sketch Mode)
Pick[0]/Close[A]/Undo[B]/Pick and drag (Enter to end): pick and drag
Drag to digitize (Pick or press Enter to stop sketching)... pick or press Enter to stop sketching
Pick[0]/Close[A]/Undo[B]/Pick and drag (Enter to end): B (undo the last point)
Pick[0]/Close[A]/Undo[B]/Pick and drag (Enter to end): B (undo the last point)
Pick[0]/Close[A]/Undo[B]/Pick and drag (Enter to end): pick and drag again
Drag to digitize (Pick or press Enter to stop sketching)... pick or press Enter to stop sketching
Pick[0]/Close[A]/Undo[B]/Pick and drag (Enter to end): 0 *(press 0 on the puck or enter 0 on the keyboard to use Pick Mode)*
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): pick next point
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): pick next point
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): pick next point
Sketch[0]/Close[A]/Undo[B]/Pick next point (Enter to end): press Enter to finish digitizing
Digitize Another Contour [<Yes(A)>/No(B)]? B (press B to finish digitizing)

Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.
Keyboard Command: digcont_exist, digcont_final

Digitize Sections

This command allows you to digitize section lines and store the section data in the section file you have specified. The command first prompts you the **Digitize Section Dialog**. Enter the section file name and determine if you want to digitize second and third sections at the same station. Look at your plans and determines the station interval, which is used to automatically default to the next station value when digitizing a series of stations. If the grids at all the stations have the same base elevation, toggle on Use Fixed Base Grid Elevation. You can also toggle on Interpolate Zero Offset Elevation, Prompt for Subgrades, Prompt for Save for Each Section and Use Beeps with Prompts. Surface Snap Tolerance sets the maximum distance that the program will automatically snap the tie back point between the subgrade and design surface. **Preview Method** offers 2 ways to view the sections as you digitize. "Graphic Dialog" displays the section data in a grid dialog and is best when digitizing from paper plans. "Draw on Drawing" draws 2D polylines in your CAD drawing and is best when digitizing over an Image in your drawing. "Keep Drawing Preview" will leave the 2D polylines in your CAD drawing (having this checked off will erase the 2D polylines after each station). Click OK to start digitizing.

Takeoff prompts you to calibrate the section sheet before you digitize the section lines. You pick three points and specify their offsets to the centerline and elevations in order to determine the horizontal and vertical intervals. Corners on the section grid are preferred reference points. Place your cursor at one end of the section line and begin digitizing the line. While digitizing a line, you can remove a mistake by **pressing A** on the puck or **entering Undo** on the keyboard. At the end of the section line, **press Enter** on your puck or keyboard. The station is completed, and the station value is automatically incremented. The command would prompts to digitize next section. You can **press A** on the puck or **enter Exit** on the keyboard to finish digitizing. If you want to continue to digitize next section, **press Enter** or enter the new station number. For every station after the first one, you can calibrate the grid sheet by picking one reference point and specify its offset and elevation. After you digitize the section lines on your drawing, all the section data would be saved in a section file (.sct).



● New ○ Append/Revise
File: C:...Todd carlson\Desktop\July\2012\Existing.sct
☑ Digitize Second Section
File: C:...s\Todd carlson\Desktop\July\2012\Design.sct
☐ Digitize Third Section
File: None
☐ Digitize Forth Section
File: None
☐ Digitize Fifth Section
File: None
Station Interval 25.000
☑ Use Fixed Base Grid Elevation
Elevation 255.000
☐ Interpolate Zero Offset Elevation
☐ Prompt For Subgrades
Surface Snap Tolerance 0.100
☐ Prompt For Save For Each Section
☐ Use Beeps With Prompts
Preview Method Draw on Drawing
☑ Keep Drawing Preview

Prompts

Digitize Section Dialog
Enter Section File Name, Station Interval, and toggle on/off Use Fixed Base Grid Elevation etc.
Section station to digitize <0.000>: *press Enter to start with station 0.0 or enter a station number*
Calibrate section sheet
Pick First section sheet reference point: *pick a grid point of this station on your drawing*
Enter offset <0.0>: *press Enter to accept the offset or enter the offset of the point to the centerline*
Enter elevation: 1030 *(enter the Elevation of the reference point)*
Pick Second section reference point: *pick the second grid point*
Enter offset: 0 *(enter the offset of the point to the centerline)*
Enter elevation: 1040 *(enter the Elevation of the reference point)*
Pick Third section reference point: *pick the third grid point*
Enter offset: 50 *(enter the offset of the point to the centerline)*

Enter elevation: 1040 *(enter the Elevation of the reference point)*
3 calibration points
Transformation type: Orthogonal Affine Projective

Outcome of fit: Success Exact Impossible
RMS Error: 11.49
Standard deviation: 2.38
Largest residual: 14.08
At point: 2
Second-largest residual: 14.08
At point: 1
Digitize break point for DRAWING1 section 0.000 (Enter to end): *pick a point on the section line*
Offset: -39.81 Elev: 1028.80
Digitize break point for DRAWING1 section 0.000 (Undo[A],Enter to end): *pick a point on the section line*
Offset: -9.94 Elev: 1030.03
Digitize break point for DRAWING1 section 0.000 (Undo[A],Enter to end): *pick a point on the section line*
Offset: 49.44 Elev: 1034.93
Digitize break point for DRAWING1 section 0.000 (Undo[A],Enter to end): *press Enter to finish*
Save changes to DRAWING1 section 0.000 [<Yes(A)>/No(B)]? A *(press A or B)*
Exit[A]/Section station to digitize <50.000>: 200 *(enter next station number)*
Calibrate next section
Pick section reference point: *pick a grid point of the station on your drawing*
Enter offset <0.00>: *press Enter to accept the offset or enter the offset of the point to the centerline*
Enter elevation <1030.00>: 1020 *(enter the Elevation of the reference point)*
Digitize break point for DRAWING1 section 200.000 (Enter to end): *pick a point on the section line*
Offset: -40.40 Elev: 1008.07
Digitize break point for DRAWING1 section 200.000 (Undo[A],Enter to end): *pick a point on the section line*
Offset: -5.38 Elev: 1019.98
Digitize break point for DRAWING1 section 200.000 (Undo[A],Enter to end): *pick a point on the section line*
Offset: 27.86 Elev: 1030.02
Digitize break point for DRAWING1 section 200.000 (Undo[A],Enter to end): *pick a point on the section line*
Offset: 50.33 Elev: 1035.80
Digitize break point for DRAWING1 section 200.000 (Undo[A],Enter to end): *press Enter to finish*
Save changes to DRAWING1 section 200.000 [<Yes(A)>/No(B)]? A *(press A or B)*
Exit[A]/Section station to digitize <250.000>: A *(press A to finish or enter the station number to continue)*

Keyboard Command: digxsec
Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.

Digitize End Areas

There are two types of end areas: cut area and fill area. This command allows you to digitize both cut area and fill area on the drawing and writes data to a .ew file. The command first prompts you to calibrate the section sheet by picking three points and specify their offsets to the centerline and elevations in order to determine the horizontal and vertical intervals. Corners on the section grid are preferred reference points. Then it prompts you to digitize the cut area and fill area respectively. Place your cursor at one end of the end area and begin digitizing the outline of the area. At the end of the section line, **press Enter** on your puck or keyboard. The end area is completed, and its area is printed on the command line, and you are prompted to digitize next end area. After you finish all the end area at one station, accumulated cut area and fill area are computed and printed out on the screen. All data of cut area and fill area at every station would be saved in the area file (.ew) that you have specified.

Prompts

Calibrate section sheet
Pick First section sheet reference point: *pick a point on the drawing*
Enter offset <0.0>: *press Enter to accept the offset (or enter the offset of the point to the centerline)*
Enter elevation: 1020 *(enter the Elevation of the reference point)*
Pick Second section reference point: *pick a point*
Enter offset: 0 *(enter the offset of the point to the centerline)*
Enter elevation: 1030 *(enter the Elevation of the reference point)*
Pick Third section reference point: *pick a point*
Enter offset: 50 *(enter the offset of the point to the centerline)*
Enter elevation: 1030 *(enter the Elevation of the reference point)*
3 calibration points
Transformation type: Orthogonal Affine Projective

Outcome of fit: Success Exact Impossible
RMS Error: 11.69
Standard deviation: 2.40
Largest residual: 14.29
At point: 2
Second-largest residual: 14.29
At point: 3
Digitize cut area (Enter to end): *pick a point that is on the outline of the cut area*, 0∗(0.211129 1030.76)
Digitize cut area (Enter to end): *pick a point that is on the outline of the cut area*, 1∗(11.5804 1030.49)
Digitize cut area (Enter to end): *pick a point that is on the outline of the cut area,* 2∗(17.8643 1030.73)
Digitize cut area (Enter to end): *pick a point that is on the outline of the cut area,* 3∗(19.0216 1032.35)
Digitize cut area (Enter to end): *pick a point that is on the outline of the cut area*, 4∗(-0.777246 1030.75)
Digitize cut area (Enter to end): *press Enter to finish*
End area: 17.2312
Accumulated Cut Area: 17.2312
More Cut Areas [Yes(A)/<No>(B)]? *press A to digitize more Cut Areas, or press B to finish digitizing Cut Areas.*
Accumulated Cut Area: 17.2312
Digitize fill area (Enter to end): *pick a point that is on the outline of the fill area*, 0∗(-18.9614 1029.65)
Digitize fill area (Enter to end): *pick a point that is on the outline of the fill area*, 1∗(-18.1315 1030.75)
Digitize fill area (Enter to end): *pick a point that is on the outline of the fill area*, 2∗(-11.9592 1030.49)
Digitize fill area (Enter to end): *pick a point that is on the outline of the fill area*, 3∗(-2.06761 1030.72)
Digitize fill area (Enter to end): *pick a point that is on the outline of the fill area*, 4∗(-10.0082 1030.01)
Digitize fill area (Enter to end): *pick a point that is on the outline of the fill area*, 5∗(-18.531 1029.67)
Digitize fill area (Enter to end): *press enter to finish*
End area: 8.64646
Accumulated Cut Area: 8.64646
More Fill Areas [Yes(A)/<No>(B)]? *press A to digitize more Fill Areas, or press B to finish digitizing Fill Areas.*
Accumulated Cut Area: 8.64646
Total Cut Area: 17.2312
Total Fill Area: 8.64646
Store data to file [<Yes>(A)/No(B)]? *press A or B*
Opened file: C:\Program Files\Carlson TakeOff 2004\DATA\Drawing1.ew
Station Number: 1 *(enter Station Number)*
Data Stored in file: C:\Program Files\Carlson TakeOff 2004\DATA\Drawing1.ew
Digitize another station [<Yes>(A)/No(B)]? B (*press A or B)*

Prerequisite: Have a digitizer board and a puck connected to your computer, and have Wintab driver installed. The digitizer has been correctly set up. Have done tablet calibration for current drawing.
Keyboard Command: digendar

Raster Menu

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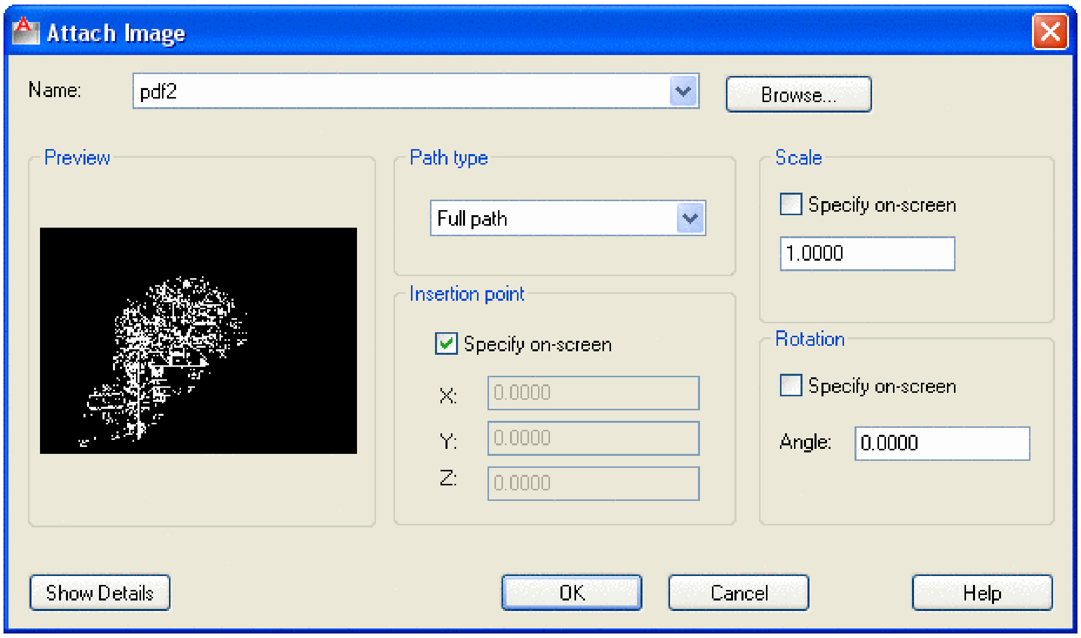
Draw Raster Image

This command inserts an Image file into your current drawing. After selecting the file you wish to draw, the following dialog is shown:



Name: pdf2

Path type: Full path

Scale: ☐ Specify on-screen 1.0000

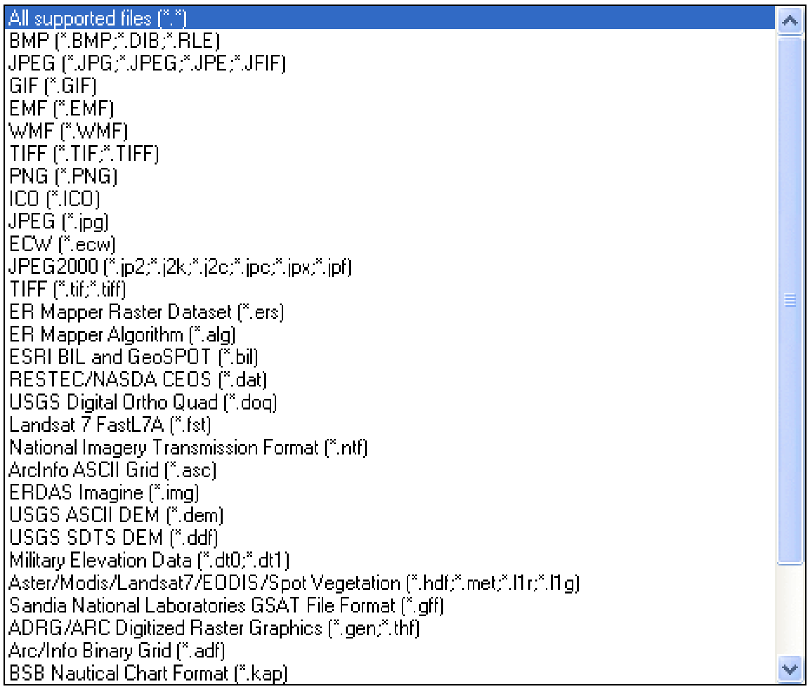
Insertion point: ☑ Specify on-screen X: 0.0000 Y: 0.0000 Z: 0.0000

Rotation: ☐ Specify on-screen Angle: 0.0000

The name of the file is shown at the top with a preview of the file shown below. To select a different file, click on the Browse button. Path Type can be set to the full (absolute) path, the relative path to the image file, or No Path, the name of the image file (the image file must be located in the same folder as the current drawing file). If the scale factor is known, you can enter it under Scale.

If the scale factor is unknown, it is recommended to use the default scale factor of 1 and adjust the Scale with Edit > 2D Scale once the Image is inserted and a scale factor can be determined.Specify On-Screen allows you to input the scale at the Command prompt. Insertion Point specifies the insertion point for the selected image file. Specify On-Screen is the default. The default insertion point is 0,0,0.

Specify On-Screen Directs input at the Command prompt or the pointing device. If Specify On-Screen is unchecked, enter the insertion point as X, Y, and Z coordinate values Rotation specifies the rotation angle of the selected image. If Specify On-Screen is selected, you may wait until you exit the dialog box to rotate the object with your pointing device or enter a rotation angle value at the Command prompt. If Specify On-Screen is unchecked, enter the rotation angle value in the dialog box. The default rotation angle is 0.
Below is list of Images that can be inserted into the drawing. For PDF files, use the Import PDF File (loadpdf) command available in Carlson Takeoff.



All supported files (*.*)
BMP (*.BMP;*.DIB;*.RLE)
JPEG (*.JPG;*.JPEG;*.JPE;*.JFIF)
GIF (*.GIF)
EMF (*.EMF)
WMF (*.WMF)
TIFF (*.TIF;*.TIFF)
PNG (*.PNG)
ICO (*.ICO)
JPEG (*.jpg)
ECW (*.ecw)
JPEG2000 (*.jp2;*.j2k;*.j2c;*.jpc;*.jpx;*.jpf)
TIFF (*.tif;*.tiff)
ER Mapper Raster Dataset (*.ers)
ER Mapper Algorithm (*.alg)
ESRI BIL and GeoSPOT (*.bil)
RESTEC/NASDA CEOS (*.dat)
USGS Digital Ortho Quad (*.doq)
Landsat 7 FastL7A (*.fst)
National Imagery Transmission Format (*.ntf)
ArcInfo ASCII Grid (*.asc)
ERDAS Imagine (*.img)
USGS ASCII DEM (*.dem)
USGS SDTS DEM (*.ddf)
Military Elevation Data (*.dt0;*.dt1)
Aster/Modis/Landsat7/EODIS/Spot Vegetation (*.hdf;*.met;*.l1r;*.l1g)
Sandia National Laboratories GSAT File Format (*.gff)
ADRG/ARC Digitized Raster Graphics (*.gen;*.thf)
Arc/Info Binary Grid (*.adf)
BSB Nautical Chart Format (*.kap)

Prompts

Specify the insertion point: pick on the screen or typing in a coordinate (Example: 1000,1000).
Specify rotation angle: To accept the default value displayed, press Enter, or enter the rotation angle (Example: 90).
Specify scale <1.0>: To accept the default value displayed, press Enter, or enter a scale factor. If the scale factor is not known, which is typical, accept the defaults to this prompt. The proper scale factor can be determined by running Inquiry>Standard Distance on a known distance on the site (ie, the side of a building or the distance across the road). If the side of a building is labeled as 60' and Standard Distance reports it is at 120', then the Scale factor is 0.5 (60/120). Run Edit>2D Scale, select the imported objects, specify a base point of 0,0 and use the Scale Factor you determined with Standard Distance to scale the entities correctly.
After the command has imported the Image file, run View > Zoom > Extents to see the converted entities.

Pulldown Menu Location: Raster > Draw Raster Image
Keyboard Command: imageattach
Prerequisite: None

Set Raster Image

The Raster pull-down has several commands for manipulating images. However, these commands can only work with one image at a time. Set Raster Image determines which image in a drawing is "current" to edit. Simply run the command and select the image.

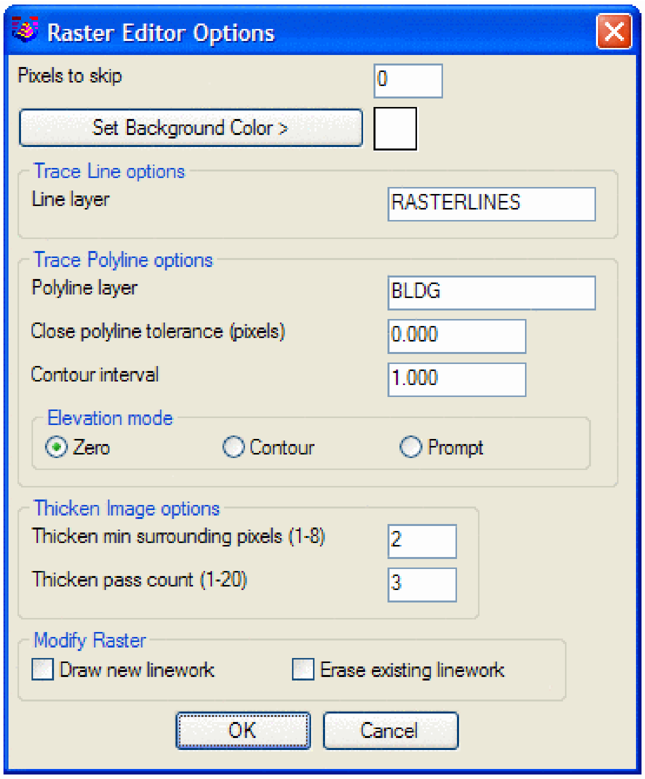
Prompts

Command: rassel
Select image: Pick on the image (often you will need to pick on the boundary of the image to select it)
Image selected. Image file: pdf1.bmp

Pulldown Menu Location: Raster > Set Raster Image
Keyboard Command: rassel
Prerequisite: an image in the drawing

Raster Edit Options

General Settings for working with images can be found in the command Raster Edit Options. Defaults are shown below.



Raster Editor Options

Pixels to skip: 0

Trace Line options
Line layer: RASTERLINES

Trace Polyline options
Polyline layer: BLDG
Close polyline tolerance (pixels): 0.000
Contour interval: 1.000

Elevation mode
● Zero ○ Contour ○ Prompt

Thicken Image options
Thicken min surrounding pixels (1-8): 2
Thicken pass count (1-20): 3

Modify Raster
☐ Draw new linework ☐ Erase existing linework

Pixels to skip: This setting applies to the Trace Line and Trace Polyline commands. As the program determines where to draw the new linework, it can "skip" or pass over a given amount of pixels who's color does not match the rest of the linework that is being processed. This allows for longer length polylines to be created on poor quality images. A larger amount of pixels to skip will typically create longer length new linework.

Line and **Polyline layer** determines the Layers for the new linework.
Close polyline tolerance (pixels): While running the Trace Polyline command, this setting will automatically close the polyline if you select an point within the defined tolerance from the starting point.
Contour interval: In the Contour Mode of Trace Polyline, this setting determines the value to add or subtract to polyline elevations.
Elevation Mode: Zero, Contour, or Prompt. By default, Trace Polyline creates linework at Zero elevation. **Contour Mode** speeds up elevating multiple polylines by adding (or subtracting) the Contour interval to the previous elevation value. **Prompt Mode** allows the user to specify the elevation of each polyline created.
Thicken min surrounding pixels (1-8): When running the "rasthicken" command (type-in only, not in pull-down menu), the routine looks at the surrounding pixels of an individual pixel and will change the color of that individual pixel to the surrounding pixels if minimum amount is met. The lower the number, the more "thickening" or densifying will occur.
Thicken pass count (1-20): This is the number of times the "rasthicken" command (type-in only, not in pull-down menu) will run in a selected area. The greater number of passes, the more "thickening" or densifying will occur.
Draw new linework will update the source Image file with the new linework you create through "Trace Line" or

"Trace Polyline".
Erase existing linework will remove linework segments from the source Image file as you trace over those segments.

Pulldown Menu Location: Raster > Raster Edit Options
Keyboard Command: rasopts
Prerequisite: none

Clear Strata Surface

Trace Line will convert a line in an image into a single CAD polyline. If an image is "current" through the **Set Raster Image** command, simply run **Trace Line** and click on a line in the image. In the command line, you will see the **Line Length**, **Angle**, and **Thickness** reported for the new polyline. The command line will also prompt you to change the **Angle**, **Length** or **Reverse** the direction the new polyline if desired. To accept the new line press Enter. To cancel, type C or press Esc.
Different images have different resolutions or quality to them. To account for this, you can adjust the parameters that the program tries to recognizes linework in an image with **Edit Raster Options**. Here is also where the default **Layer** for the new polyline is determined.

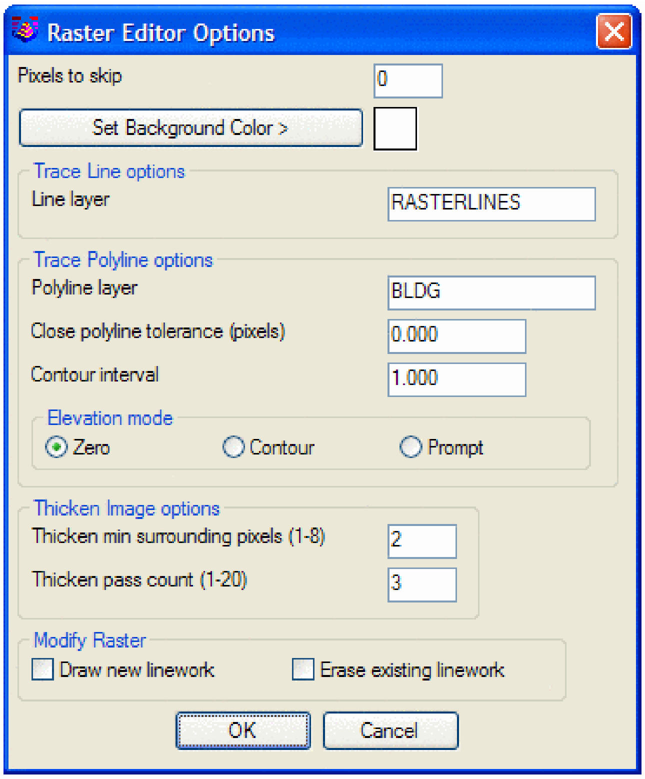
Prompts

Pick a point for line (Enter to end): Select a line in the image
Line Length=780.00 Angle=269°32'47" Thickness=5
Enter to accept line or [Angle/Reverse/Length/Cancel]: Type in the first letter in a word to adjust that element of the new polyline**.** For example, typing in "A" would allow you to adjust the Angle**.**

Pulldown Menu Location: Raster > Trace Line
Keyboard Command: rasline
Prerequisite: Set Raster Image

Clear Strata Surface

Trace Polyline will convert linework in an image into a CAD polyline with multiple vertices. If an image is "current" through the **Set Raster Image** command, run **Trace Polyline** and name or select the Layer for the new polyline. Once in the command, typing "O" for **Options** will open up the Edit Raster Options dialog.



Pixels to skip: 0
Line layer: RASTERLINES
Polyline layer: BLDG
Close polyline tolerance (pixels): 0.000
Contour interval: 1.000
● Zero ○ Contour ○ Prompt
Thicken min surrounding pixels (1-8): 2
Thicken pass count (1-20): 3
☐ Draw new linework ☐ Erase existing linework

Here you can determine the **Pixels to skip.** As the program determines where to draw the new linework, it can "skip" or pass over a given amount of pixels who's color does not match the rest of the linework that is being processed. This allows for longer length polylines to be created on poor quality images. A larger amount of pixels to skip will typically create longer length CAD linework. However, if the image linework is mostly solid, then the pixels to skip should be a smaller amount.
Also in this dialog the user can determine the **Elevation Mode**: Zero, Contour, or Prompt. By default the polyline is set to Zero elevation. **Contour Mode** speeds up elevating multiple polylines by adding (or subtracting) the Contour interval to the previous elevation value. **Prompt Mode** allows the user to specify the elevation of each polyline created. For a full explanation of this dialog, refer to the **Edit Raster Options** entry in this manual.

Pick Segment will convert linework in the image into a new poyline. Unlike the Trace Line command, multiple segments can be selected one after the other to create a continuous polyline with multiple vertices. **Manual Point** allows you to pick a Manual point or Snap nearest point to start the new polyline. A manual or "free" point can be anywhere in the CAD environment. A Snap nearest point is anywhere along linework in the image.

Prompts

Pick segment or [Options/Manual point/Continue] (Enter to end): pick on linework in the image or type "m" for Manual point
Pick manual point or [Snap nearest] (Enter to end): if you typed "m" you have the option to pick a "free" point or type "s" to snap a point
Pick manual point using snap nearest or [No snap] (Enter to end): pick on linework in the image to snap to
Pick segment or [Manual point/Undo/Close] (Enter to end): Undo will remove the last segment created, Close will create a closed polyline

Pulldown Menu Location: Raster > Trace Polyline
Keyboard Command: raspline
Prerequisite: Set Raster Image

Raster Nearest Snap

Similar to the standard Object or Entity Nearest Snap with CAD entities, **Raster Nearest Snap** will snap to the nearest point ona linework segment or point in an Image. This command can be used with Draw commands such as Draw > 2D Polyline.

Pulldown Menu Location: Raster > Raster EndPoint Snap
Keyboard Command: rnea
Prerequisite:most Draw commands

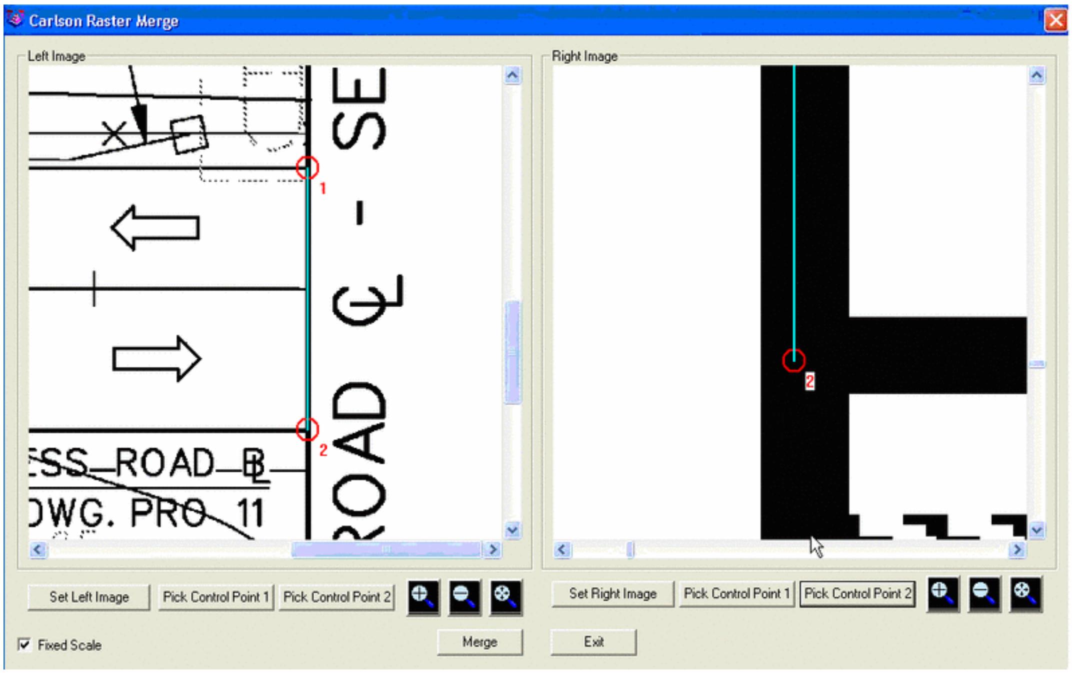
Raster EndPoint Snap

Similar to the standard Object or Entity EndPoint Snap with CAD entities, **Raster EndPoint Snap** will snap to the closest endpoint of a point or linework segment in an Image.This command can be used with Draw commands such as Draw > 2D Polyline.

Pulldown Menu Location: Raster > Raster EndPoint Snap
Keyboard Command: rend
Prerequisite:most Draw commands

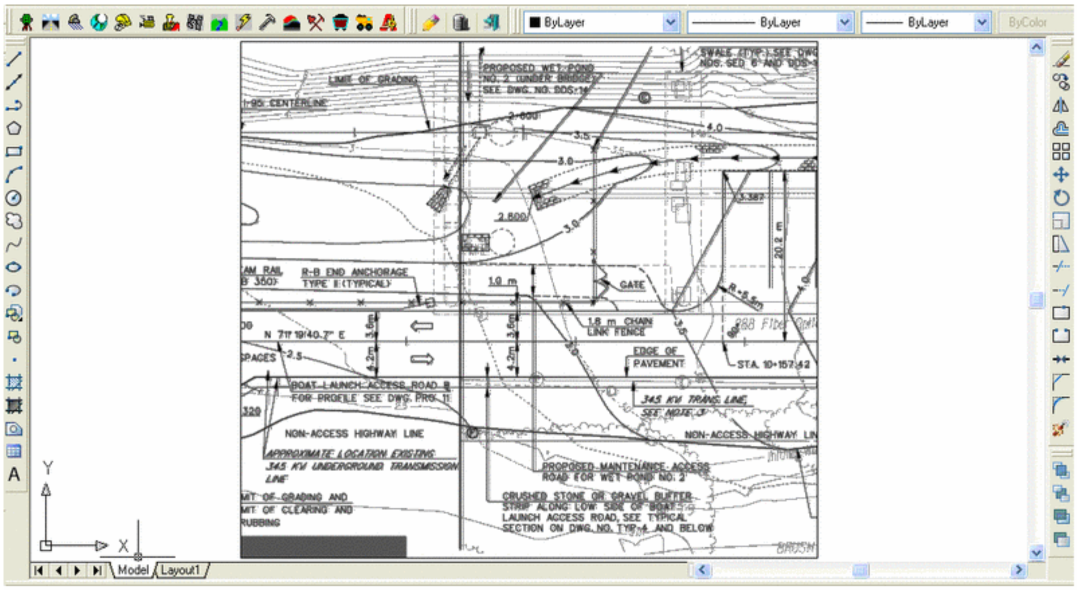
Merge Raster Files

This commands merges bitmaps or other images (not pdf-based, unless the pdf has been turned into an image). First, run "Set Left Image" and "Set Right Image" to determine the files to merge. Next, pick identical control points on the left side and right side. Zoom in and pick the best that you can. This establishes the scale, rotation, and alignment for the merge. Note: the preview windows are labeled "Left Image" and "Right Image", but the program will merge images "Top" to "Bottom" if the control points are aligned in that orientation.


Carlson Raster Merge
Left Image
1
2
ROAD ℄ - SE
ESS_ROAD_B
DWG. PRO 11
Right Image
2
Set Left Image
Pick Control Point 1
Pick Control Point 2
☑ Fixed Scale
Merge
Set Right Image
Pick Control Point 1
Pick Control Point 2
Exit

After establishing control points, click the Merge button and it merges the left with the right side. When you click Save Image, you can save it in a number of distinct forms (typically as a .bmp is sufficient). Notice the program automatically removed the match line text, with no overlap. The key is that your two reference points for scale and rotation, which match, must be at the linear overlap line, because everything to either side is removed automatically.

Originally, the two images overlapped, but now that has been removed.



Pulldown Menu Location: Raster > Merge Raster Files
Keyboard Command: rasmerge
Prerequisite: Two or more Images you'd like to combine

Cut Image

This tool is used to clean up an Image at the extents of a polyline boundary. First, select the inclusion boundary polyline(s) and any exclusion boundary polyline(s). Everything in the Image to the inside of these polyline is removed. Warning: this command will update the Image seen on the screen as well as the source Image.

Pulldown Menu Location: Raster > Cut Image
Keyboard Command: rascut
Prerequisite: an Image and a closed polyline

Crop Image

This tool is used to clean up an Image at the extents of a polyline boundary. First, select the boundary polyline(s). Everything in the Image to the outside of this polyline is removed. Warning: this command will update the Image seen on the screen as well as the source Image.

Pulldown Menu Location: Raster > Crop Image
Keyboard Command: rascrop
Prerequisite: an Image and a closed polyline

Remove Speckles

Images that have been scanned in from paper plans often have unwanted black dots or "speckles" that can be removed with this command. Depending on the image, there is a max speck size that can be set. The larger the size indicated, the more specks will be removed. You can specify the area to remove specks from based on the entire drawing or by a closed inclusion polyline. Warning: this command will update the Image seen on the screen as well as the source Image.

Pulldown Menu Location: Raster > Remove Speckles
Keyboard Command: rasdespeckle
Prerequisite: an Image

Undo Raster Edit

Undo Raster Edit will revert an Image back to its original form (both on-screen and source) from changes made by: Image Cut, Image Crop, Remove Speckles, Trace Line or Trace Polyline. It will not remove any polylines created by Trace Line or Trace Polyline.

Pulldown Menu Location: Raster > Undo Raster Edit
Keyboard Command: rasundo
Prerequisite: an Image that has been edited

Elevate Menu

8

Change Elevations

This command will change the elevation of selected Entities. It can move the entity to a specified elevation from its current elevation (absolute) or do a differential change by adding or subtracting a value from its current elevation. If Carlson TakeOff points are selected, their attribute text and z axis coordinate are changed.

Prompts

Ignore zero elevations (<Yes>/No)? *Press Enter.* If you answer *No*, then entities with elevation 0 will be changed.
[A]bsolute or [D]ifferential Change <A>: *A*
Select/<Enter Elevation <0.0000>>: *125*
Change Layer for changed entities [Yes/<No>]: No
Elevation to change to:

By using the Absolute option all entities selected are changed to the elevation 125.

Select Entities for elevation change.
Select objects: *C*
First corner: *(pick point)*
Other corner: *(pick point)*
Select objects: *[Enter]*

Keyboard Command: chgelev
Prerequisite: Something to change

Set Polyline to Elevation

This command allows you to assign elevations to one or more polylines. The elevation can be assigned by entering in the value or by picking a text entity that has the elevation.

Prompts

Select/<Enter Elevation <0.0000>>: Select a text entity or type in an elevation. Press enter for the default elevation in brackets.

Select Polyline for elevation change. Pick on the screen a polyline you wish to change such as:
LWPOLYLINE
Done.
Set another polyline [<Yes>/No]? Press Y to pick another polyline to assign an elevation to. Type in N to finish the command.

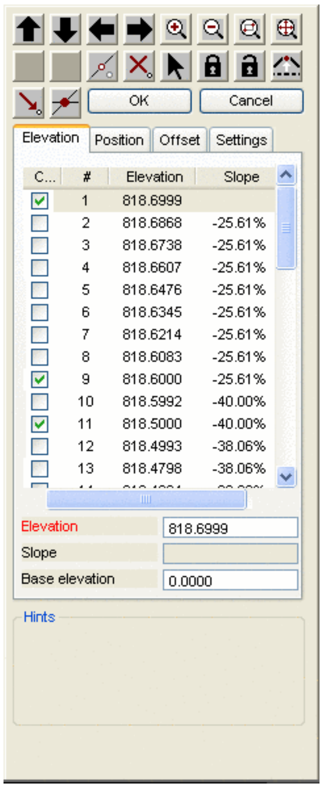
Keyboard Command: set_pline_z
Prerequisite: A polyline and an elevation to assign it.

Edit-Assign Polyline Elevations

This command allows very precise control of 3D polylines, specifically in the ability to edit vertex elevations, as well as add, delete, or move vertices. You can also control the location of polyline vertices as defined by the station and offset of the vertices relative to a Centerline.

Polyline vertices are designated as either Control or Free vertices. The elevation of Control vertices are set and held, the elevations of Free vertices are interpolated. In the drawing, control vertices are shown with red boxes, along with their vertex number and elevation. Free vertices are displayed with blue boxes and are not annotated.

When you run the command, you are first prompted to select a polyline to edit. When you pick a polyline to work with, the following control panel appears on the left side of your screen.



C...	#	Elevation	Slope
☑	1	818.6999	
☐	2	818.6868	-25.61%
☐	3	818.6738	-25.61%
☐	4	818.6607	-25.61%
☐	5	818.6476	-25.61%
☐	6	818.6345	-25.61%
☐	7	818.6214	-25.61%
☐	8	818.6083	-25.61%
☑	9	818.6000	-25.61%
☐	10	818.5992	-40.00%
☑	11	818.5000	-40.00%
☐	12	818.4993	-38.06%
☐	13	818.4798	-38.06%

Elevation 818.6999
Slope
Base elevation 0.0000

The top row of buttons across the top of the control panel are used to manipulate the view in the drawing with various Zooming and Panning options. The second and third row of buttons will change as you select different tabs, but are essentially used to add vertices, delete vertices, or pick elevations or locations for vertices. The Add vertex at crossing icon will pick up the elevation of any selected crossing linework and add an elevated vertex at the intersection.

The four tabs in the panel provide access to control of polyline vertex Elevation, Position, Offset and Settings.

Elevation: This tab displays the vertices of the polyline, each with a check box to set whether it is a control vertex or free, its assigned number, its elevation, and the slope from the previous vertex to that vertex. Selecting a vertex highlights its grip in the drawing. Once selected, you can enter an elevation or slope for that vertex in the spaces below the list, thereby automatically setting the vertex to a control vertex. The Base Elevation is used to adjust the elevations of all the vertices simultaneously.

Position: The Position tab displays the coordinates of each vertex. To move a vertex, you can type in new coordinates, use the Pick Position icon to specify a new location for the vertex on the screen, or you can grip the vertex and drag it to a new location.

Offset: The Offset tab requires the selection of a Centerline to reference. Once a Centerline is designated, the Station, Slope, and Offset of each vertex relative to the Centerline is displayed and can be edited.

Settings: The Settings tab provides control over various overall options pertaining to the use of the command. For example, hiding free vertices and setting how to report your slopes between vertices. "Allow X-Y Dragging" let's you control whether a polyline can move horizontally when you add new vertices to it. Options are Always, Never, or to be Prompted each time when adding a vertex.

Right-click menu: There is a right-click menu available at all times which also gives access to a variety of functions and settings.

Keyboard Command: edit_pline_z
Prerequisite: Polylines with vertexes

2D to 3D By Surface Model

This command converts a 2D polyline into a 3D polyline by calculating 3D polyline vertices at all the intersects of the 2D polyline with surface entities (contour polylines, triangulation lines) and by interpolating elevations from these intersections at the original vertices locations. An application for this command is to create breaklines. For example, a ridge breakline could be generated from contour lines by drawing a 2D polyline along the ridge and across the contours. Then this command could grab the contour line elevations along the polyline to make a ridge breakline.

In addition to using entities in the drawing, the 2D polyline can be converted to 3D using a surface model stored in triangulation (.flt or .tin) file. If you use a file, then you can also use the polyline's current elevation as a vertical offset from surface.

Prompts

By Screen Entities:
Source of surface model [File/<Screen>]? *Type S for Screen*
Select polylines to convert.
Select objects: *select the polyline(s) to convert*
Select surface 3DFaces, lines and polylines.
Select objects: *select the surface entities (contour polylines, breaklines, triangulation lines, etc)*

Reading points ... 692

Keep existing polylines [Yes/<No>]? *Press Enter*
This command creates a new 3D polyline, and this prompt allows you to keep the old polyline.
Set layer name for converted polylines [Yes/<No>]? *Press Enter*
This allows you to assign the new polyline to a layer.
Converting polylines ...
Converted 1 polylines.

By a .flt or .tin File:
Source of surface model [<File>/Screen]? *Type F for File*
Select polylines to convert.
Select objects: *select the surface entities (contour polylines, breaklines, triangulation lines, etc)*

Use current polyline elevations as vertical offset from surface [Yes/<No>]? *Press Enter*
This will offset the new polyline by its current elevation. That is, if a polyline has an elevation of -4 and the surface you are converting it to has an elevation of 800, then saying Yes will drape the polyline at an elevation of 796.
Keep existing polylines [Yes/<No>]? *Press Enter*
This command creates a new 3D polyline, and this prompt allows you to keep the old polyline.
Set layer name for converted polylines [Yes/<No>]? *Press Enter*
This allows you to assign the new polyline to a layer.

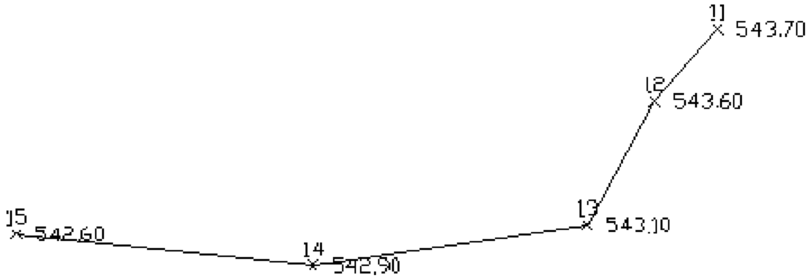
Keyboard Command: 2dto3dp
Prerequisite: A polyline and surface lines or grid file or triangulation file.

2D to 3D Polyline by Points

This command adds 3d data to polylines by using the elevations of points. At each vertex of the polylines, the program looks for a point with elevation at the same x,y location. The points can be Carlson point blocks or AutoCAD POINT entities. This routine can be useful if the linework is created in 2D at zero elevation, and points with elevation are located along the linework. It can also be used in conjunction with other 2D to 3D commands to elevate polylines by more then one method. The linework can be converted into 3D polylines with this command. For example, a centerline polyline with arcs may need to be created in 2D for stationing because AutoCAD does not allow arcs on 3D polylines. To use this polyline as a breakline in surface modeling, this command can convert the polyline into a 3D polyline.

Prompts

Select points and polylines.
Select objects: select polylines to convert and the points with elevation

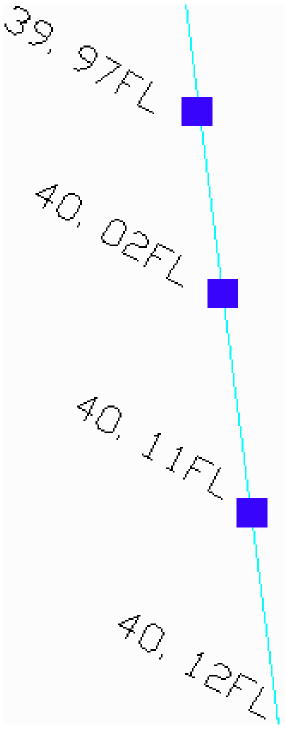


Keyboard Command: 2dto3dpt
Prerequisite: A polyline and points

2D to 3D Polyline-By Text

This command adds 3d data to polylines by elevation labels. This command will prompt you for samples of the elevation labels and the polylines to convert. The program uses these samples to know the layer names for the labels and linework to process. Then select all the polylines with their labels you want to convert.

You will then be prompted to enter in an elevation to add to label values. Often times elevations are abbreviated to save time and space. If every elevation in a drawing is in the 500s instead of labeling every elevation 539.97, 540.02, 540.11 sometimes, like in the example on the side, they are listed as 39.97, 40.02, 40.11. This command allows you to add a given amount, such as 500, to every label elevation to produce the correct elevation in the drawing. This command will assign elevations from the labels to nearby vertices. If vertices do not have a close elevation label than they will be interpolated from vertices that are nearby elevation labels. The vertices elevated in this command will appear as control vertices in the command Edit-Assign Polyline Elevations. It can also be used in conjunction with other 2D to 3D commands to elevate polylines by more then one method.



Prompts

Select sample of elevation text: Pick a text label
Select sample of a polyline to convert: Pick a polyline
Select polylines to convert and elevation labels.

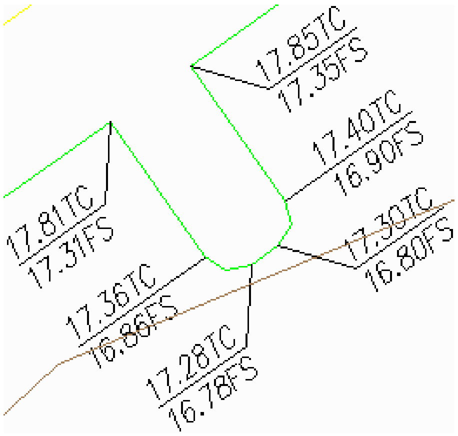
Select objects: Select all the entities to process
19 found, 19 total

Enter elevation to add to label values <0.00>: 500
Pre-processing entity #19 of 19
Filtering text entities
Processing elevation text #18
Remaking polyline #1

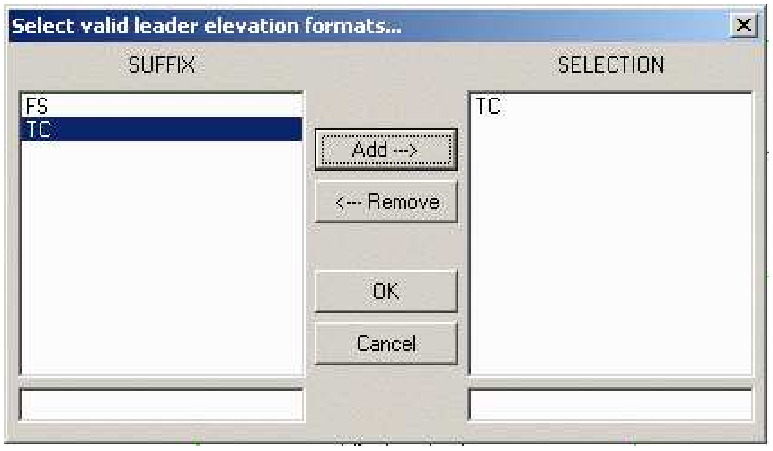
Keyboard Command: elevfb
Prerequisite: 2D polyline and elevation labels

2D to 3D By Text With Leader

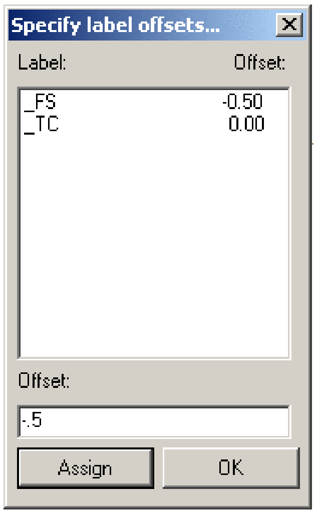
This command will assign elevations from the labels to the polylines by following the label leaders to their corresponding vertices on the polyline.


17.85TC
17.35FS
17.40TC
16.90FS
17.81TC
17.31FS
17.30TC
16.80FS
17.36TC
16.86FS
17.28TC
16.78FS

This command will prompt you for samples of the elevation labels, the leaders, and the polylines to convert. The program uses these samples to know the layer names for the labels and linework to process. Then select all the labels and leaders for the polylines you want to convert. You will then be prompted to enter in an elevation to add to label values. Often times elevations are abbreviated to save time and space. If every elevation in a drawing is in the 800s instead of labeling every elevation 817.85, 817.40, 817.30 sometimes, like in the above example, they are listed 17.85, 17.40, 17.30. This command allows you to add a given amount, such as 800, to every label elevation to produce the correct elevation in the drawing.

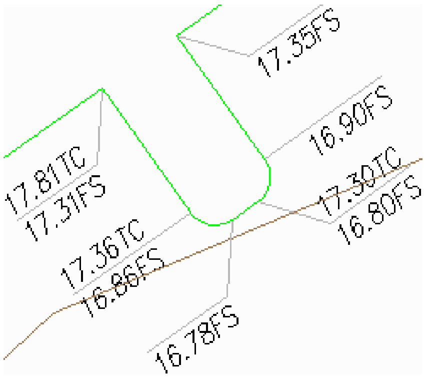

Select valid leader elevation formats...
SUFFIX
SELECTION
FS
TC
TC
Add -->
<-- Remove
OK
Cancel

Carlson TakeOff searches for all leaders and gathers their associated text. If the program finds different labels in the elevation text, then this dialog box allows you to select the text you want to create 3D polylines. In this example you might want to use elevations followed by TC. This dialog box allows you to select that text and exclude the other text which is not to be used in the elevations of the polyline, such as FS.



Label:	Offset:
_FS	-0.50
_TC	0.00

Offset: -.5



If you are creating 3D polylines from multiple elevation labels than this dialog box will allow to offset certain labels by a given amount. In the above example you can offset an elevation labeled FS by .50 so that it matches vertices set by TC labeled elevations. The vertices elevated in this command will appear as control vertices in the command Edit-Assign Polyline Elevations. It can also be used in conjunction with other 2D to 3D commands to elevate polylines by more then one method.

Prompts

Select sample of elevation text: Pick a text label
Select sample of an annotation leader: Pick an annotation leader
Select sample of a polyline to convert: Pick a polyline
Select polylines to convert, leaders and elevation labels to process.
Select objects: Select the desired entities
22 found
3 were filtered out.

Select objects:

Enter elevation to add to label values <0.00>: 800
Pre-processing entity #19 of 19
Filtering text entities
Processing leader #6
Remaking polyline #1

Keyboard Command: elevfl
Prerequisite: 2D polyline, elevation labels, and leaders

2D to 3D Polyline by Start-End Elevations

This command allows you to convert a 2D polyline to a 3D polyline by specifying the starting and ending elevations of the polyline. All intermediate polyline vertice elevations are linearly interpolated from these end point elevations.

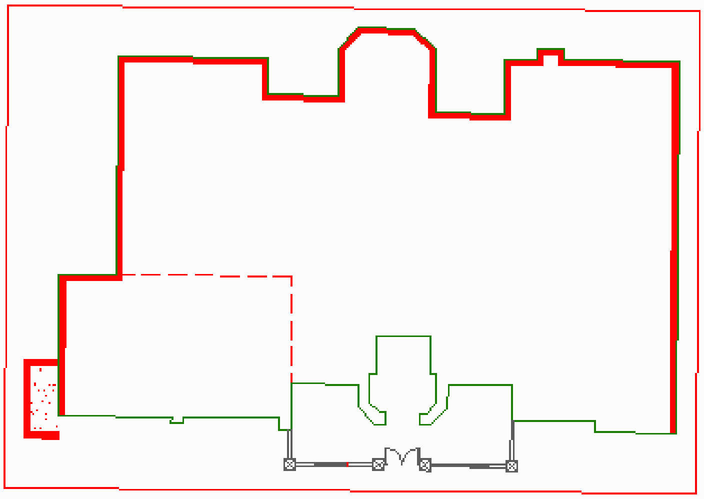
Prompts

Select polyline to assign elevations:
Enter starting elevation: *109.85*
Percent/Ratio/<Enter ending elevation>: *112.16*
Select polyline to assign elevations (Enter to End): *press enter to end*

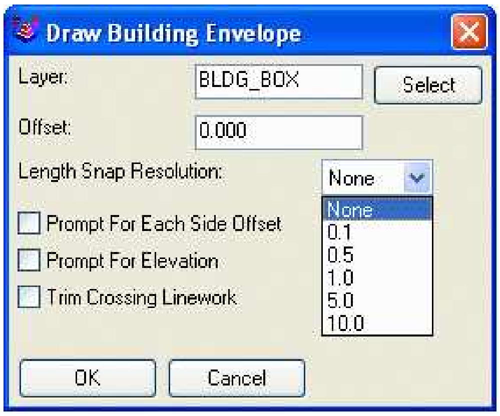
Keyboard Command: 2dto3dpl
Prerequisite: A polyline

Draw Building Envelope Polyline

This command creates a rectangular polyline around selected linework. This can be used to give a building all one elevation.



Select the entities that make up the building. Next you will be prompted to name the layer and In the dialog, you can set the layer name for the new linework, set one offset distance, or select to be prompted for each side to offset. Also, you can set the elevation of the envelope and trim crossing linework to ensure you have a flat pad.



Layer: BLDG_BOX
Offset: 0.000
Length Snap Resolution: None
☐ Prompt For Each Side Offset
☐ Prompt For Elevation
☐ Trim Crossing Linework

Length Snap Resolution: Will round the dimensions of the created Building Envelope by a certain tolerance. For example, if you select None you may get a Building Envelope of 37.4 x 25.2. However, if you set the Length Snap Resolution to 0.5, you will get a Building Envelope of 37.5 x 25.0.

Prompts

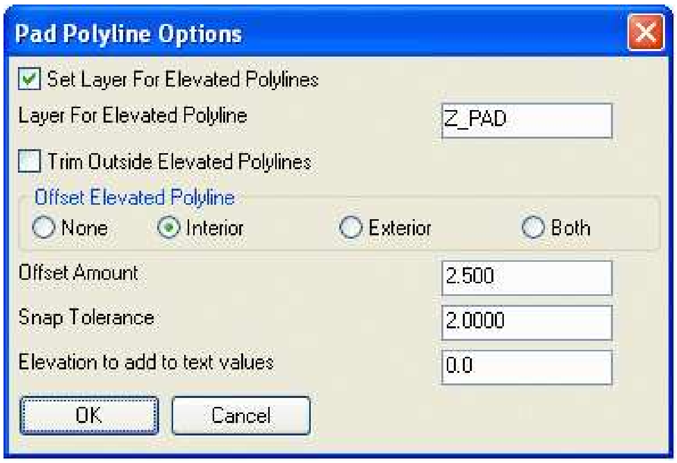
Select building lines.
Select objects: *pick the linework that makes up the perimeter of the building*
Enter the segment horizontal offset <0.000>: *10*
Enter the segment horizontal offset <10.000>: *Enter*
Enter the segment horizontal offset <10.000>: *5*
Enter the segment horizontal offset <5.000>: *Enter*
Select/<Enter Elevation <0.0000>>: *400*
Draw another building envelope [<Yes>/No]? *No*

Keyboard Command: bldg_perim
Prerequisite: a pad

Pad Polyline By Interior Text

This command allows you to set one or more pad elevations using interior text labels.

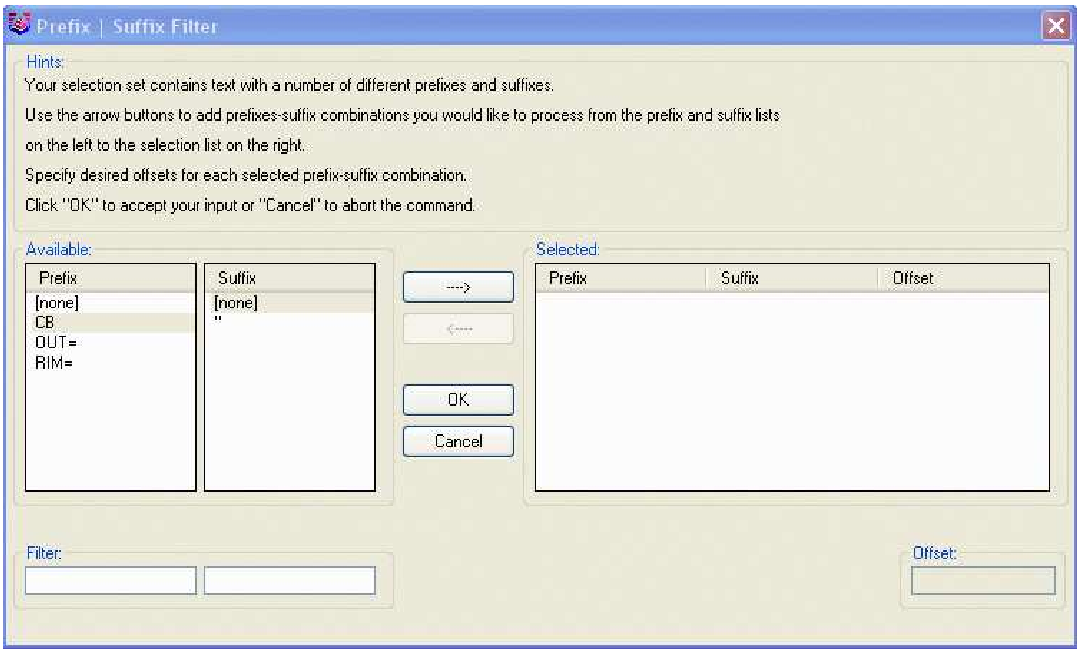
After running the command you will be prompted to select the layers you want to use for the pad elevation and for the boundary of the pad. Sometimes pads are drawn with linework from two different layers and Carlson TakeOff allows you to pick all the correct linework.



☑ Set Layer For Elevated Polylines
Layer For Elevated Polyline: Z_PAD
☐ Trim Outside Elevated Polylines
Offset Elevated Polyline: ○ None ● Interior ○ Exterior ○ Both
Offset Amount: 2.500
Snap Tolerance: 2.0000
Elevation to add to text values: 0.0

This dialog box allows you to create a new layer with the correct x,y coordinates and elevations. If the pad shares the same coordinates with other linework with different elevations than this dialog box allows you to offset the new polyline to avoid the problem of shared occupied points with different elevations. You can choose to have an interior offset or an exterior offset and also decide how much to offset the new polyline. Selecting Both will give both the interior pad elevation and the exterior contour elevations. This helps the transition from you pad elevation to the design contouring. The Snap Tolerance field joins linework which falls within the range you set to create a pad. Trim Outside Elevated Polylines will trim out contour elevations that go through your pad that you are not using elevations from within the pad.
Elevation to add to text values adds to the values from the elevation labels. Often times elevations are abbreviated to save time and space. If every elevation in a drawing is in the 500s instead of labeling every elevation 523.5, 543.3, 537.2 sometimes they are listed as simply 23.5, 43.3, 37.2. This command allows you to add a given amount, such as 500, to every label elevation to produce the correct elevation in the drawing.

After running the command you will be prompted to select the layers you want to use for the pad elevation and for the boundary of the pad. Sometimes pads are drawn with linework from two different layers and Carlson TakeOff allows you to pick all the correct linework. In addition, if your text has multiple Prefixes and Suffixes you will be prompted to select the ones you want to use the elevation from.



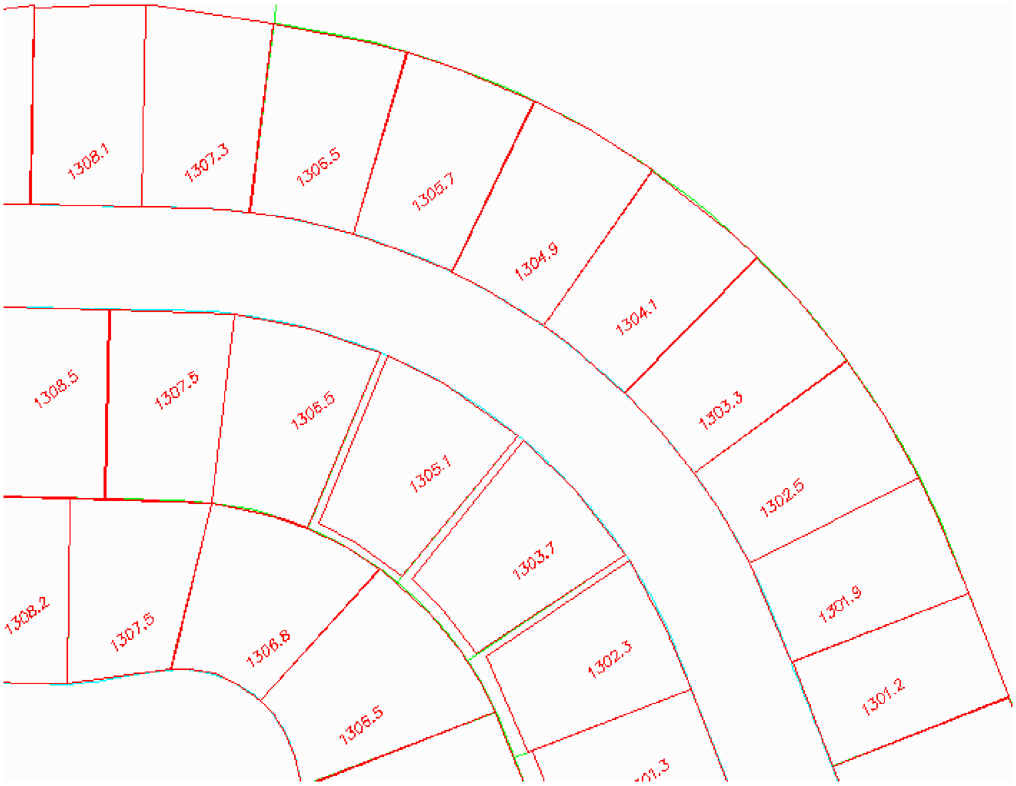
Your selection set contains text with a number of different prefixes and suffixes.

Use the arrow buttons to add prefixes-suffix combinations you would like to process from the prefix and suffix lists on the left to the selection list on the right.

Specify desired offsets for each selected prefix-suffix combination.

Click "OK" to accept your input or "Cancel" to abort the command.

After clicking <OK> select all the pads and their elevation labels that you wish to change, press <Enter>, and the new layer with elevations will be created and placed in the Design target.


1308.1
1307.3
1306.5
1305.7
1304.9
1304.1
1303.3
1302.5
1301.9
1301.2
1308.5
1307.5
1306.5
1305.1
1303.7
1302.3
1301.3
1308.2
1307.5
1306.8
1306.5

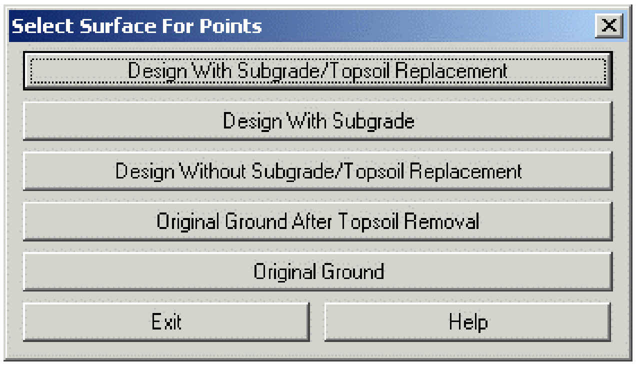
Prompts

Select layer sample of elevation text: Pick a label text
Selected text layer —-TX07
Select layer sample of boundary linework:
Selected linework layer PAD
Select another layer sample of boundary linework (Enter to continue):
Select text and linework to process.
Select objects: 1 found
Select objects: 1 found, 2 total
Select objects:
Analyzing entire selection...
Set elevation for 1 polylines.

Keyboard Command: pad_by_text
Prerequisite: Pad polylines and elevations

Set_Point_Elevations_To_Surface

This command allows you to set point elevations on a selected surface.


Select Surface For Points
Design With Subgrade/Topsoil Replacement
Design With Subgrade
Design Without Subgrade/Topsoil Replacement
Original Ground After Topsoil Removal
Original Ground
Exit
Help

Select the surface that you want elevations to be added, either from Design With Subgrade/Topsoil Replacement, Design With Subgrade, Design Without Subgrade/Topsoil Replacement, Original Ground After Topsoil Removal, and Original Ground. Next, pick the points to convert and this command will set the elevations of the points to the surface.

Prompts

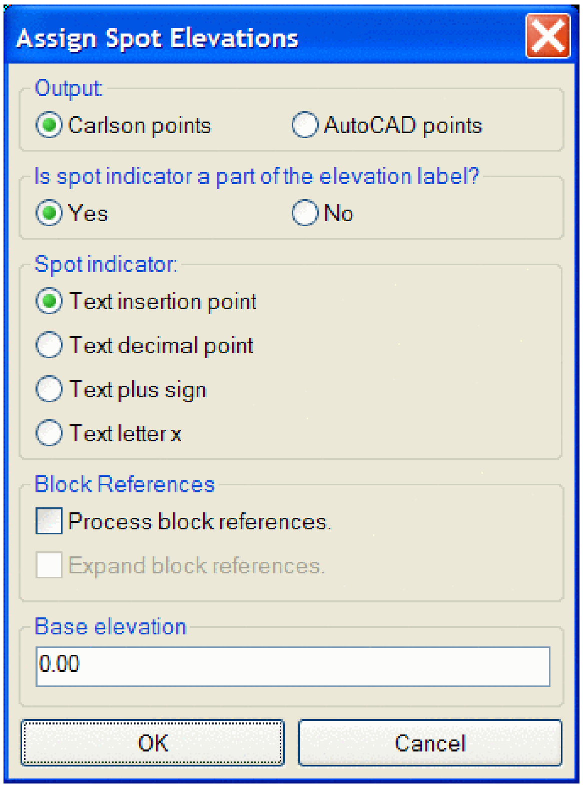
```
Command:
3DCONVERT
Loading edges...
Loaded 5057 points and 14923 edges
Created 9866 triangles

Select points to convert.
Select objects: Specify opposite corner: 86 found, 25 groups
11 were filtered out.

Select objects:

Converting points...
Converted 25 points.
```

Prerequisite: a surface with an elevation and points to convert

Keyboard Command: 3DCONVERT

Convert Spot Elev To Points

This command takes spot elevation entities with zero elevations and assigns them elevations according to corresponding elevation labels. This dialog box allows you to choose the format of the spot elevations entities that you want to convert.


Assign Spot Elevations

Output
● Carlson points ○ AutoCAD points

Is spot indicator a part of the elevation label?
● Yes ○ No

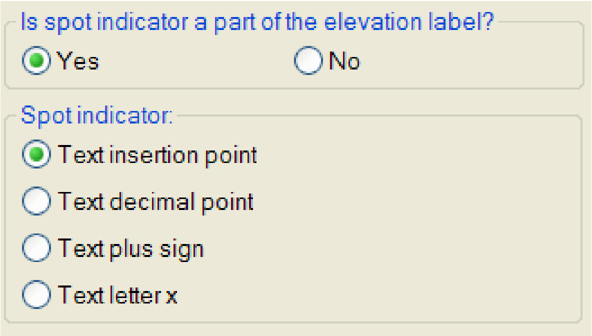
Spot indicator:
● Text insertion point
○ Text decimal point
○ Text plus sign
○ Text letter x

Block References
☐ Process block references.
☐ Expand block references.

Base elevation
0.00

Output:
Carlson points: creates Carlson points at elevation of spot and stores them in coordinate file
AutoCAD points: creates AutoCAD point objects at elevation of spot

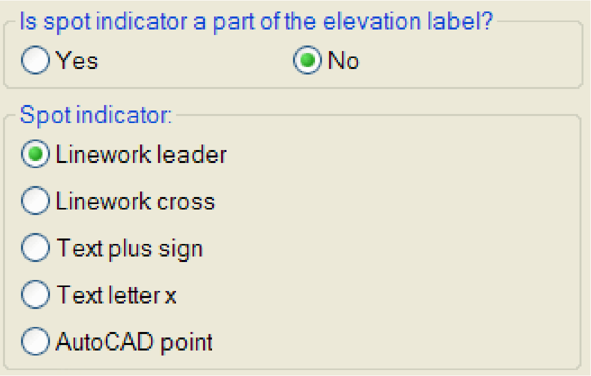
Is spot indicator a part of the elevation label?
If set to "Yes", four choices for Spot indicator are available to select from:


Is spot indicator a part of the elevation label?
● Yes ○ No

Spot indicator:
● Text insertion point
○ Text decimal point
○ Text plus sign
○ Text letter x

Text insertion point: uses the insertion point of the text for the location of the new point
Text decimal point: uses the decimal point in the text for the location of the new point
Text plus sign: uses the plus sign in the text for the location of the new point
Text letter x: uses the letter x in the text for the location of the new point

If set to "No", five choices for Spot indicator are available to select from:



Is spot indicator a part of the elevation label?

○ Yes ● No

Spot indicator:

● Linework leader

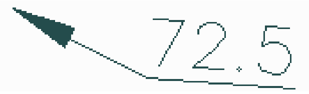
○ Linework cross

○ Text plus sign

○ Text letter x

○ AutoCAD point

Linework leader: creates a data point at the end of a leader

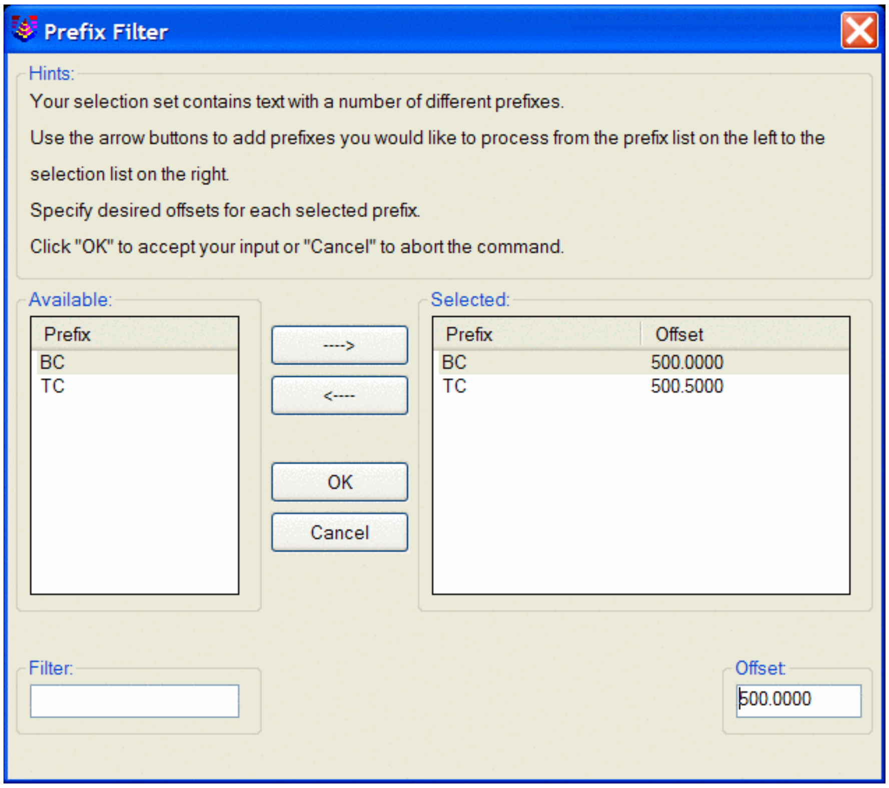


Linework cross: creates a data point at the intersection of a linework cross
Text plus sign: creates a data point at the insertion point of a text plus sign
Text letter x: creates a data point at the middle of a text letter x
AutoCAD point: creates a data point at the node of an AutoCAD point

Block References:
Process Block References: If check box is cleared, Carlson Civil searches only text entities for elevations, but if checked, Carlson Civil will search block references for elevations that are stored as attributes of a block. Use this option if the elevation is an attribute and the symbol designating the location of the spot elevation are both part of the block definition.
Expand Block References: Use this option to search block references when the elevation is stored as an attribute of a block, but the symbol designating the location of the spot elevation is a different block or even other geometry that is not defined within a block.

Base elevation: The value entered here is added to the existing spot elevations for all newly created points. Often times elevations are abbreviated to save time and space. If every elevation in a drawing is in the 500s instead of labeling every elevation 523.5, 543.3, 537.2 sometimes they are listed as simply 23.5, 43.3, 37.2. This command allows you to add a given amount, such as 500, to every label elevation to produce the correct elevation in the drawing. Note: The base elevation will not be added to any elevations that are closer to the base elevation value than they are to 0; e.g. if a base elevation of 500 is specified, 500 will be added to elevations like 23.4, 45.5, etc, but will not be added to elevations like 456.4 or 468.9.

Prefix Filter: Carlson Civil examines all selected spot elevations for prefixes or suffixes. If they are all the same, the command proceeds, but if there are different prefixes and/or suffixes found, the Prefix Filter dialog box is invoked. This dialog box allows you to select which prefixes and/or suffixes to use to create spot elevations, and also allows you to use different offset values for each. .


Prefix Filter

Hints:
Your selection set contains text with a number of different prefixes.
Use the arrow buttons to add prefixes you would like to process from the prefix list on the left to the selection list on the right.
Specify desired offsets for each selected prefix.
Click "OK" to accept your input or "Cancel" to abort the command.

Available:

Prefix
BC
TC

Selected:

Prefix	Offset
BC	500.0000
TC	500.5000

Filter:

Offset: 500.0000

Prompts

Starting point number <1>: *press Enter*
Select TEXT, MTEXT spot elevations to process and any associated leader lines:
Select objects: *pick entities to process*
Pre-processing entity #40 of 40...
Filtering text entities
Processing elevation #40...
Converted 40 spot elevations.

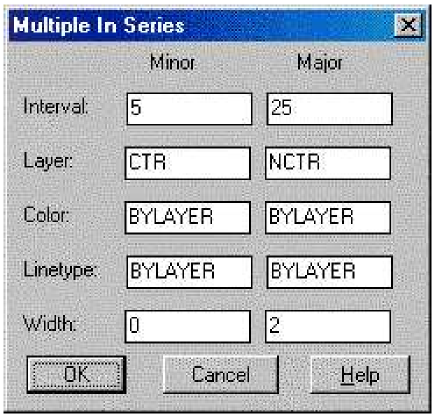
Keyboard Command: spotelv2
Prerequisite: Spot elevations

Assign Contour Elevation - Multiple in Series

This command can be used to quickly and accurately assign the elevation of series ofAutoCAD polylines that have been converted from raster or digitized without correct elevations. The routine will automatically assign elevations to the polylines crossing the fence line selected by two points. At the same time the elevations are changed, the program can assign it a new layer, color, linetype, and polyline width. This process usually works best if contours are in a temporary (white)layer to start. When they are processed, they will take on the color of the new layers making it easy to distinguish which polylines have been processed.

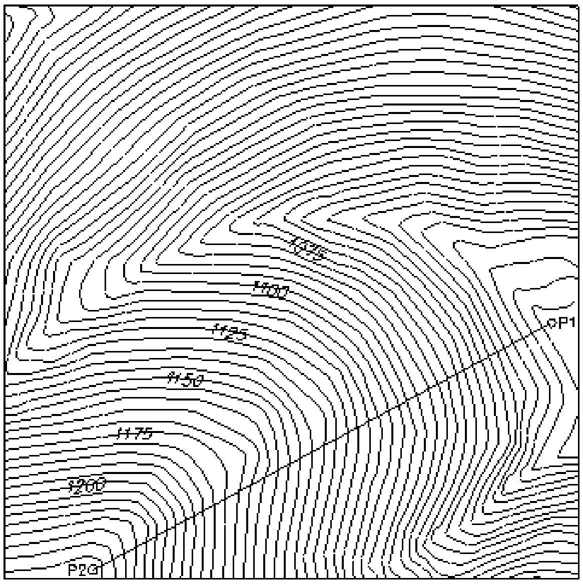
Prompts

Settings/First Point: *(Press S to change settings or pick first point.)*
Second Point: *(Pick second point)*
Beginning Elevation <0.00>: *1020*
Increment Direction U/D <U>: *(enter)*



Multiple In Series

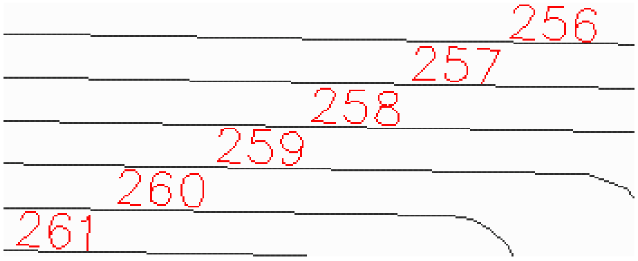
	Minor	Major
Interval:	5	25
Layer:	CTR	NCTR
Color:	BYLAYER	BYLAYER
Linetype:	BYLAYER	BYLAYER
Width:	0	2



Keyboard Command: grpcelev
Prerequisite: digitized polylines

Assign Contour Elevation - From Contour Labels

This command allows you to set elevations to contours from elevation labels.



Select a sample of the elevation text to be used on the contouring. Next, select a sample of the contouring that you want to add the elevations to. Now select all the contours and their corresponding elevation labels and press <Enter>. Carlson TakeOff will then add elevations to all the contours. You may be prompted to distinguish what contour goes with what elevation label. You can either press <Enter> to accept the contour that Carlson TakeOff has selected or you can Press <N> to choose another contour.

Prompts

```
Select sample of elevation text:
Select sample of a contour line:
Select contour lines and elevation text to process.
Select objects: all
5049 found
4041 were filtered out.

Select objects:

Joining adjacent polylines...
Reading the selection set ...
Joining ...
Pre-processing entity #1008 of 1008
Filtering text entities
Processing elevation text #518

Conflict detected: pick contour corresponding to current elevation text
Press N for next selection or Enter to accept current:
Remaking polyline #311
```

Keyboard Command: TXTCELEV
Prerequisite: contours and contours labels

Assign Contour Elevation - Single Elevation Group

This command changes the elevations of polylines and can be used to set the elevations of contour polylines. The routine begins at a specified elevation and prompts for a selection set of polylines to set to the elevation. Then the routine repeats using the last elevation plus the elevation increment. Enter an empty selection set to exit the routine.

Prompts

```
Starting elevation <0.0>: 500.0
Contour interval (negative for down) <1.0>: 5.0
Select polylines to set to elevation 500.0.
Select objects: pick the polylines
Select polylines to set to elevation 505.0.
Select objects: pick the polylines
Select polylines to set to elevation 510.0.
Select objects: Press Enter
```

Keyboard Command: setcelev
Prerequisite: polylines

Drape 3D Polyline On Surface

This command converts a 2D polyline into a 3D polyline by calculating 3D polyline vertices at all the intersects of the 2D polyline with surface entities (contour polylines, triangulation lines) and by interpolating elevations from these intersections at the original vertices locations. An application for this command is to create breaklines. For example, a ridge breakline could be generated from contour lines by drawing a 2D polyline along the ridge and across the contours. Then this command could grab the contour line elevations along the polyline to make a ridge breakline.

In addition to using entities in the drawing, the 2D polyline can be converted to 3D using a surface model stored in triangulation (.flt or .tin) file. If you use a file, then you can also use the polyline's current elevation as a vertical offset from surface.

Prompts

By Screen Entities:
Source of surface model [File/<Screen>]? *Type S for Screen*
Select polylines to convert.
Select objects: *select the polyline(s) to convert*
Select surface 3DFaces, lines and polylines.
Select objects: *select the surface entities (contour polylines, breaklines, triangulation lines, etc)*

Reading points ... 692

Keep existing polylines [Yes/<No>]? *Press Enter*
This command creates a new 3D polyline, and this prompt allows you to keep the old polyline.
Set layer name for converted polylines [Yes/<No>]? *Press Enter*
This allows you to assign the new polyline to a layer.
Converting polylines ...
Converted 1 polylines.

By a .flt or .tin File:
Source of surface model [<File>/Screen]? *Type F for File*
Select polylines to convert.
Select objects: *select the surface entities (contour polylines, breaklines, triangulation lines, etc)*

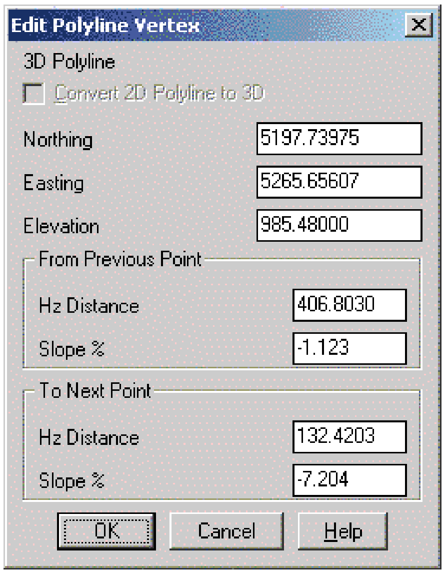
Use current polyline elevations as vertical offset from surface [Yes/<No>]? *Press Enter*
This will offset the new polyline by its current elevation. That is, if a polyline has an elevation of -4 and the surface you are converting it to has an elevation of 800, then saying Yes will drape the polyline at an elevation of 796.
Keep existing polylines [Yes/<No>]? *Press Enter*
This command creates a new 3D polyline, and this prompt allows you to keep the old polyline.
Set layer name for converted polylines [Yes/<No>]? *Press Enter*
This allows you to assign the new polyline to a layer.

Keyboard Command: 2dto3dp
Prerequisite: A polyline and surface lines or grid file or triangulation file.

Edit Polyline Vertex

This tool allows you to make changes in the coordinates of vertices on all polyline types. Upon execution you will be asked to select a polyline to edit. Upon selection a temporary marker will be placed at all of the vertices of the polyline, making them easy to distinguish. Then pick near the vertex you wish to edit, and the following dialog appears.

At the top of the dialog it identifies the type of polyline, being 2D or 3D. In the case of 2D polylines it allows you convert the polyline. You have the ability to type in new northing, easting or elevation values. You can also determine the 3D coordinate position by using distances and slope to/from adjacent points. As you change the values in the dialog, new values for derivatives are being calculated. For example if you change the horizontal distances, the coordinates will change.



Northing 5197.73975
Easting 5265.65607
Elevation 985.48000

From Previous Point
Hz Distance 406.8030
Slope % -1.123

To Next Point
Hz Distance 132.4203
Slope % -7.204

Prompts

Select polyline vertex to edit: *pick a polyline at the point to be modified*
Pick or enter position <5264.23,5048.21>: *pick a point*
Enter elevation <0.00>: *Press Enter*
Select polyline vertex to edit: *Press Enter to end*

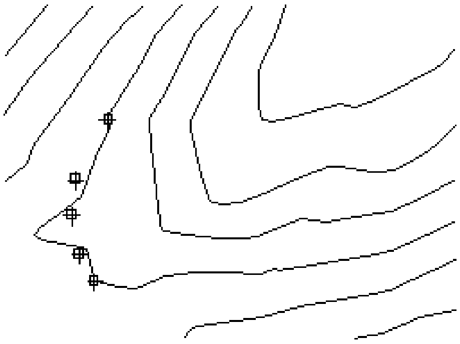
Keyboard Command: editpl
Prerequisite: A polyline.

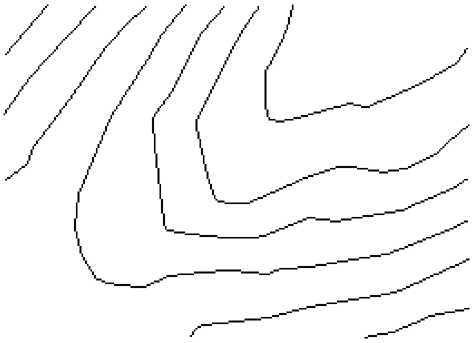
Edit Contours

This command revises a segment of a contour polyline. Begin by picking a point on the contour where you want to start editing. Then pick new points for the polyline. When finished picking new points, press Enter and then pick a point on the contour to connect with the new points. The polyline segment between the start and end points is then replaced with the new points.

Prompts

Select contour to edit: *pick the contour polyline at the place to start editing*
Pick intermediate point (Enter to End): *pick a point*
Pick intermediate point ('U' to Undo, Enter to End): *pick a point*
Pick intermediate point ('U' to Undo, Enter to End): *Press Enter*
Pick reconnection point on contour: *pick the contour polyline at the place to join*



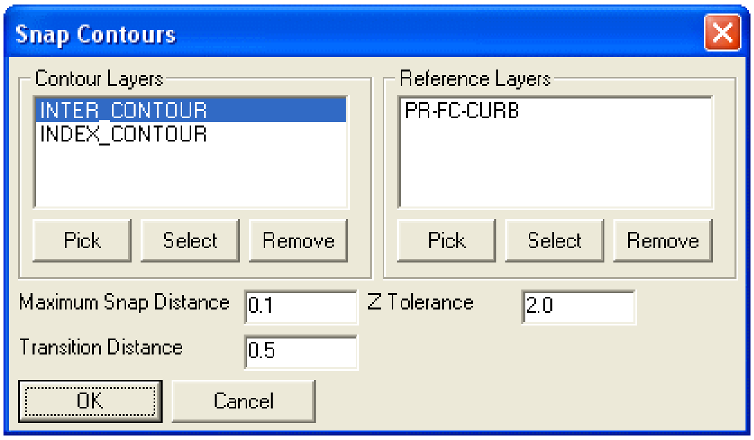


Edit this contour by picking new points
Contour with segment replaced with new points

Keyboard Command: editctr
Prerequisite: polylines with elevation (contour polylines)

Snap Contours to 3D Polylines

Snap Contours to 3D Polylines can be used to align contour polylines to match elevation with intersecting of a 3D polylines. Doing so will fix spikes in a surface model. The program will ask for the Contours to be adjusted. Pick will allow you to grab the contours from the plain view, Select allows you to identify the layer(s) from a list. The layers under Contour Layers will be adjusted to match the Reference Layers at the point of intersection. A Reference layer can de identified by Pick or Select as well.
The Maximum Snap Distance is the furthest distance along the Reference line the Contour polyline will move in order to match elevations. Z Tolerance sets the minimum elevation difference between the Reference line and the Contour polyline for the program to process. Anything less than this number will not be modified. Transition Distance is the length over which the positioning change will be applied to the Contour polylines.



Maximum Snap Distance 0.1
Z Tolerance 2.0
Transition Distance 0.5

After selecting OK, you will be prompted for the entities to process. Pick or Window Select the linework you want to process. You can also type in "all" to select everything. Here is a standard report that is displayed on the command line:

```
Entities in set: 282
Select entities:
Contour polylines: 125 Processed, 12 Adjusted
```

Pulldown Menu Location: Elevate (in Takeoff), 3D Data (in Civil)
Prerequisite: 3D linework
Keyboard Command: snap_cntrs

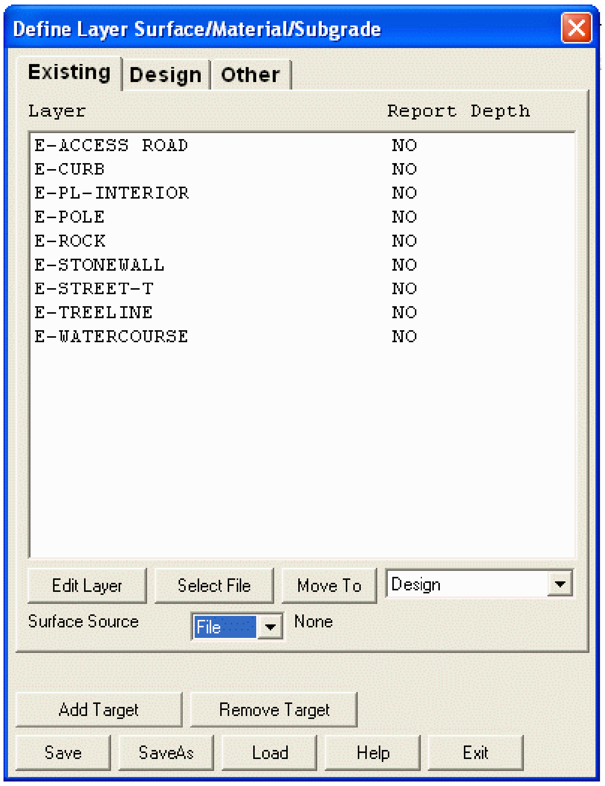
TakeOff Menu

9

Define Layer Target/Material/Subgrade

The Define Layer Surfaces dialog box (shown here) offers many functions that will ultimately make up the surface models used in volume and material calculations. Every entity (line, polyline, point, etc) in a drawing is assigned a layer name. Carlson Takeoff uses the entity layer names to define which entities represent the existing ground surface, the design surface or no surface. These surfaces are referred to as the "Target" surfaces. Any previously created triangulation file (.tin) can be set to the design or existing Target with the Surface Source drop-down set to File. In this mode, the Select File button will allow you to pick the .tin file you want to use for the Target.

When the Surface Source drop-down is set to Layers, drawing entities are assigned to target surface by their layer name. For example, if polylines representing design contours are on the layer "Final", then "Final" will be set as a layer for the design surface. For layers of entities that are for neither existing nor design surfaces (such as text labels for street names), the layer target is set to Other. The Define Layer Surfaces dialog has three lists for layer targets: Existing, Design and Other. To switch between lists, pick the tabs at the top of the dialog. To move a layer to a target destination, highlight the desired layer, choose the target from the Move To list and pick the "Move To" button. All layers populate the "Other" target before being assigned to "Existing" or "Design".



Layer	Report Depth
E-ACCESS ROAD	NO
E-CURB	NO
E-PL-INTERIOR	NO
E-POLE	NO
E-ROCK	NO
E-STONEWALL	NO
E-STREET-T	NO
E-TREELINE	NO
E-WATERCOURSE	NO

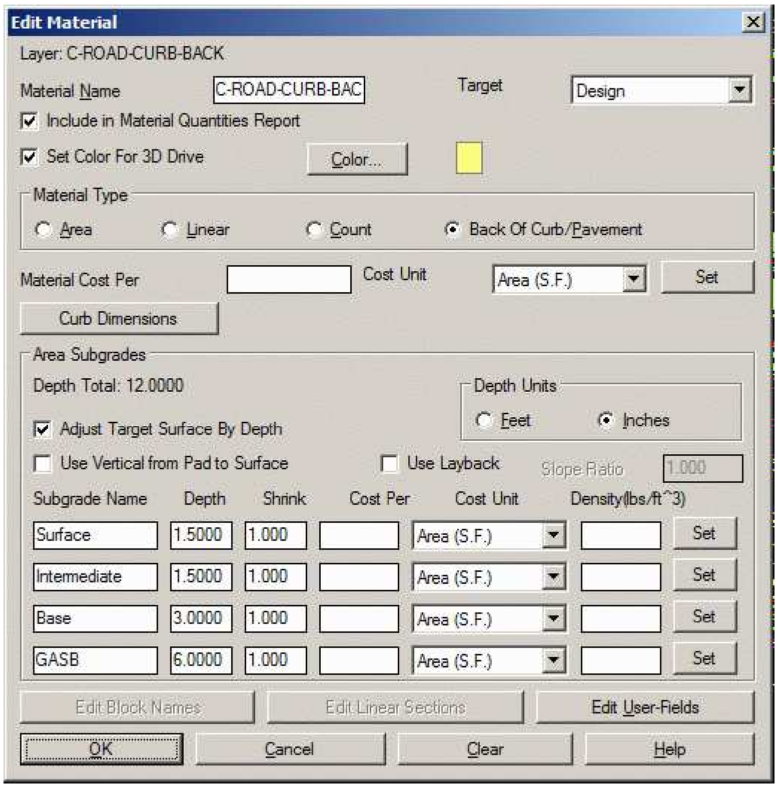
Move To: Design

Surface Source: File None

Besides the basic three layer targets (Existing, Design and Other), you can add more target surfaces with the Add Target button. When another target is defined, there will be another tab along the top of the Define Layer Surfaces dialog. Then layers can be assigned to this additional target surface. The only pre-defined additional surface is Overexcavate. The layers that are assigned to the Overexcavate target can be modeled into the Overexcavate surface using the Make Overexcavate Surface command. Besides Overexcavate, the other additional targets are user-defined. The layer targets can be modeled using the Make User-Defined Surface command. Then these surfaces can be used in Takeoff commands by assigning them to a Takeoff existing or design surface using the Set Active Surfaces command.

Edit Materials

The "Edit" button activates the Edit Material dialog box (shown here) and allows you to define the Material name and Subgrade depths and names. Besides assigning target surfaces by layer, layers are also used to define material names and subgrades depths. By assigning a material name, Subgrade names and depths to layers, the volume, area, length and count for entities on these layers can be reported. Also the depth is used to vertically adjust the design surface, or tie into the design surface by a Slope Ratio if "Use Layback" is checked on. **For Area and Back Of Curb/Pavement material types, the polylines on the layer used for a Material must be closed polylines.** Carlson Takeoff supports nested Subgrade polylines for exclusion areas such as islands by counting how many Subgrade polylines surround an area. If the number is odd, then the area is included in the Subgrade. The even count regions in the area are not part of the Subgrade. To activate the Edit Material, select a layer from the list and then choose "Edit".



Layer: C-ROAD-CURB-BACK

Material Name: C-ROAD-CURB-BAC

Target: Design

☑ Include in Material Quantities Report

☑ Set Color For 3D Drive

Material Type: ○ Area ○ Linear ○ Count ● Back Of Curb/Pavement

Material Cost Per:

Cost Unit: Area (S.F.)

Area Subgrades

Depth Total: 12.0000

Depth Units: ○ Feet ● Inches

☑ Adjust Target Surface By Depth

☐ Use Vertical from Pad to Surface

☐ Use Layback

Slope Ratio: 1.000

Subgrade Name	Depth	Shrink	Cost Per	Cost Unit	Density(lbs/ft^3)
Surface	1.5000	1.000		Area (S.F.)	
Intermediate	1.5000	1.000		Area (S.F.)	
Base	3.0000	1.000		Area (S.F.)	
GASB	6.0000	1.000		Area (S.F.)	

Include in Material Quantities Report

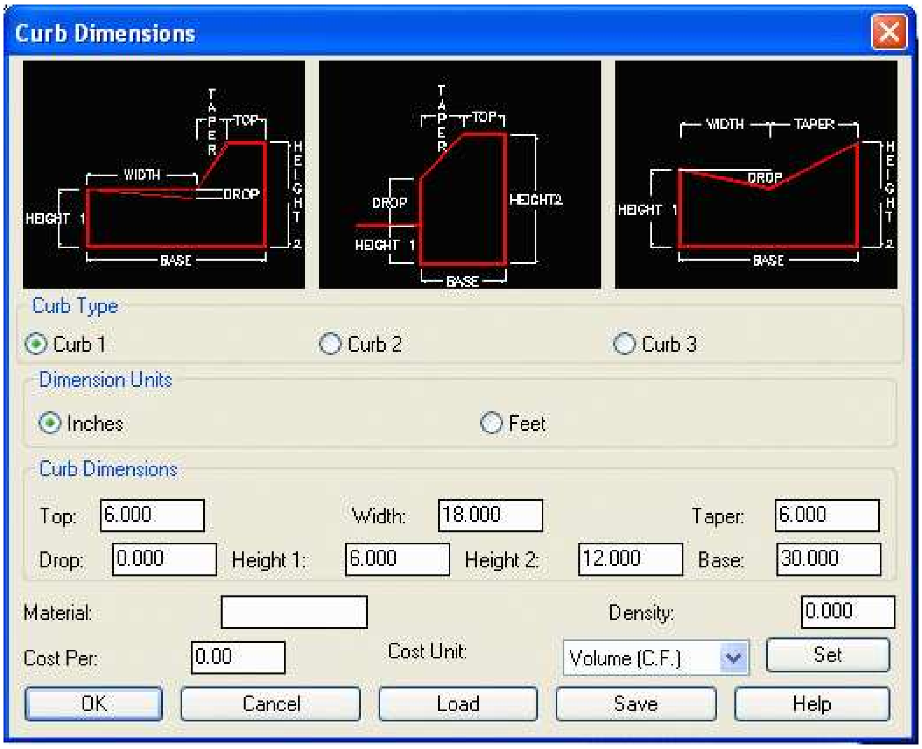
With this option checked on, the material that is named will appear in the Material Quantities Report. The report will include either the area of the material, the linear length of the material, or the number of items counted on the layer defining the material. This is accomplished by choosing "Area", "Linear", or "Count" for the Material Type.

Set Color For 3D Drive

This option allows you to assign a color for this particular material for display purposes during the 3D view/drive simulator.

Material Type

This will report the subgrade by area, linear length, count, or as curb/pavement area. If you choose Back of Curb/Pavement then you can pick on the Curb Dimensions button and bring you to the below dialog:



Curb Type

● Curb 1 ○ Curb 2 ○ Curb 3

Dimension Units

● Inches ○ Feet

Curb Dimensions

Top: 6.000 Width: 18.000 Taper: 6.000

Drop: 0.000 Height 1: 6.000 Height 2: 12.000 Base: 30.000

Material: Density: 0.000

Cost Per: 0.00 Cost Unit: Volume (C.F.)

When the Back of Curb/Pavement, the 3D polylines represent the back of curb elevations. The program will adjust the design surface for the height of the curb above ground to get the elevations to the top of pavement. Then the program will apply the subgrade depths. Also with this option, the program will calculate your curb volume as well as act as the limit of the pavement. The pavement limit will be from the Back of Curb polyline offset by the length of the Curb base. In the above case the base is 30 inches wide. Therefore, the pavement area will stop 30 inches before the Back of Curb polyline.

Material Cost Per Cost Unit

Use this field to add the value of the multiplier for the unit cost of your material. If the material type is an area that has multiple subgrades, use the available fields below to add each individual subgrade name, depth and cost value per unit type. If a linear or count type material type option is selected, use the "length in feet", or the "count" unit options.

Adjust Design Surface by Depth

This determines whether the subgrade depths are incorporated in the design surface or not.

Use Vertical from Pad to Surface

This will interpolate the surface model out to your layer and then vertically adjust the model to tie into the layer. With this checked off, the program will directly interpolate a surface model between your layer and the elevated entities around it.

Area Subgrades

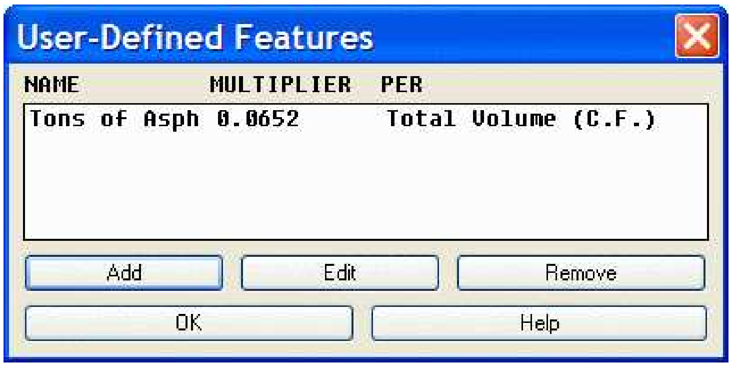
Depth Units

Select the "feet" or "inches" as the unit value desired for depth of subgrades.

Subgrade Name Depth Shrink Cost Per Cost Unit Density

Use these options for areas that are represented with a single/multiple closed polygon/polygons in the drawing, but have multiple material types defining the surface. Simply name each "lift" in the area, issue a depth value and add a cost unit if desired, or click on select and choose a material from the Materials Library (see Define Materials Library for more). Carlson Takeoff will report each subgrade material value in the material quantities report. The Shrink factor is multiplied by the subgrade volume in the material quantities report and represents the fill shrinkage. A Density factor can be entered in when using Cost Per Tons.

If user entered values are needed in the report use the "Edit User-Fields" button to activate the "User Defined Features" dialog box shown here. Choose the "Add" button to define needed fields such as TONS of material or BAGS OF GRASS SEED for reporting options.



```
NAME          MULTIPLIER  PER
Tons of Asph  0.0652      Total Volume (C.F.)
```

Once all of the material subgrades, depths and cost units or user defined units have been defined, select save to preserve the settings in a .trg file, the "save as" function allows the user to name the file to load later.

Prerequisite: None
Keyboard Command: define_tk_layers

Edit Selected Layer

Use this command to click on any layer and advance to the Edit Materials dialog from the Define Layer Target/Material/Subgrade command.

Prerequisite: none
Keyboard Command: edit_tk_layer

Set Layer For Existing

Set Layer For Existing allows the user to pick the layers from objects on the screen and assign them to the Existing Layer.

Prerequisite: none
Keyboard Command: set_existing_layer

Set Layer For Design

Set Layer For Design allows the user to pick the layers from objects on the screen and assign them to the Design Layer.

Prerequisite: none
Keyboard Command: set_design_layer

Set Layer For Other

Set Layer For Other allows the user to pick the layers from objects on the screen and assign them to the Other Layer.

Prerequisite: none
Keyboard Command: set_other_layer

Boundary Polyline

The Boundary Polyline options allow the user to Set the Boundary Polyline, Set the Exclusion Polylines, Clear Exclusion Polylines, Hatch the Boundary Area, Erase the Boundary Hatched area.

Set Boundary Polyline

Use this command to select the "CLOSED" polyline that defines the outer most limit of the disturbed area. This boundary should dissect the site at the point where the design contours meet the existing contours, or where the limit of work will occur. If your site contains separated areas (such as different phases or isolated sections of work), then multiple Boundary Polylines can be used. Volume calculation will take place inside this boundary.

Prerequisite: a closed polyline
Keyboard Command: tag_inclu

Set Exclusion Polylines

Use this command to select the "CLOSED" polylines the define the areas inside the Boundary Polyline that will not be disturbed. These boundaries should also be at the intersection of the proposed and existing surface. A pond or wetland that will not be removed during construction is a good example of an Exclusion Area.

Prerequisite: a closed polyline
Keyboard Command: tag_exclu

Clear Exclusion Polylines

Use this command to select polylines that were previously defined as exclusion polylines but are no longer needed as exclusion areas.

Prerequisite: exclusion polylines
Keyboard Command: untag_exclu

Highlight Boundary Polylines

This command highlights the polyline you set as the Boundary Polyline.

Prerequisite: a boundary polyline
Keyboard Command: highlight_boundary

Hatch Boundary Area

Use this command to confirm the boundary polylines that have been selected are correct. This hatched area can also be utilized in exhibits of the drawing.

Prerequisite: a boundary polyline
Keyboard Command: hatch_boundary

Erase Boundary Hatch

This command erases the hatch drawn in the plan view.

Prerequisite: a boundary hatch
Keyboard Command: erase_boundary

Areas Of Interest

Areas of Interest can be used to calculate volumes and material quantities within a specified area. The Area Of Interest perimeters are defined by user-selected closed polylines and each area is assigned a name. The Area Of Interest polylines can be assigned either as inclusion or exclusion perimeters for the area. You can have any number of exclusion perimeters within an inclusion but inclusion perimeters cannot be inside exclusions.

The Areas Of Interest (AOI) commands allow you to Tag/Untag Areas of Interest, Identify/Report Areas of Interest and Hatch/Label Areas of Interest.

Tag Area Of Interest

This command allows the user to select polylines and exclusion perimeters that define phases of a project. Carlson Takeoff will separate each area of interest in the volume and material reports.

Prerequisite: a desired polyline
Keyboard Command: tag_aoi

Area Of Interest by Interior Text

This command allows the user to select text from the screen to name AOIs and linework to determine the area.

Prerequisite: area linework and text
Keyboard Command: txt2aoi

Untag Area Of Interest

This command allows the user to remove previously tagged areas.

Prerequisite: an area of interest
Keyboard Command: untag_aoi

Identify Area Of Interest

This command allows users to identify AOI by either picking on a polyline(s) or by searching the entire drawing. The command will then report the AOI name, layer, type, starting point, and highlight the polyline in the plan view.

Prerequisite: an area of interest
Keyboard Command: id_aoi

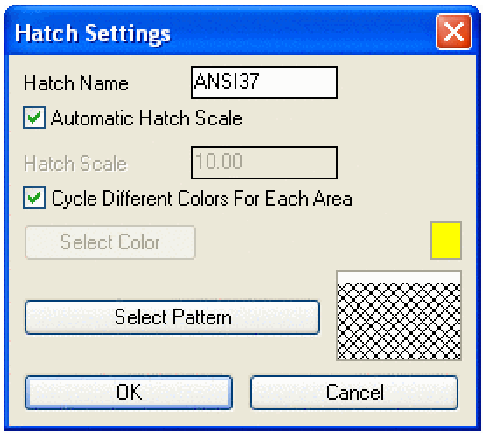
Report Area Of Interest Areas

Use this command to report the Inclusion or Exclusion area (SF), the name, the layer, and the starting point.

Prerequisite: an area of interest
Keyboard Command: report_aoi

Hatch Area Of Interest Areas

This command allows the user to visually see AOIs in the plain view.



Hatch Settings

Hatch Name: ANSI37

☑ Automatic Hatch Scale

Hatch Scale: 10.00

☑ Cycle Different Colors For Each Area

This command draws a hatch with a specified color and pattern for the Areas of Interest. The purpose is to allow you to visually review AOIs to make sure that the area coverage is correct.

The command displays a dialog for the hatch pattern, color and scale. The scale determines how spread out the pattern is within the hatch. The Automatic Hatch Scale option checks the size of the subgrade areas and sets the scale to make the pattern fit. Cycle Different Colors For Each Area will give each AOI it's own color so that you can distinguish between different AOIs.

The resulting hatch areas show where the AOI is applied. Exclusion Areas of AOIs will not be hatched.

Prerequisite: an area of interest
Keyboard Command: hatch_aoi

Erase Area Of Interest Hatch

This command erases AOI hatching.

Prerequisite: hatched area of interest
Keyboard Command: erase_aoi_hatch

Label Area Of Interest Areas

This command labels the AOI name and area in the plain view.

Prerequisite: an area of interest
Keyboard Command: label_aoi

Erase Area Of Interest Labels

This command erases AOI labeling.

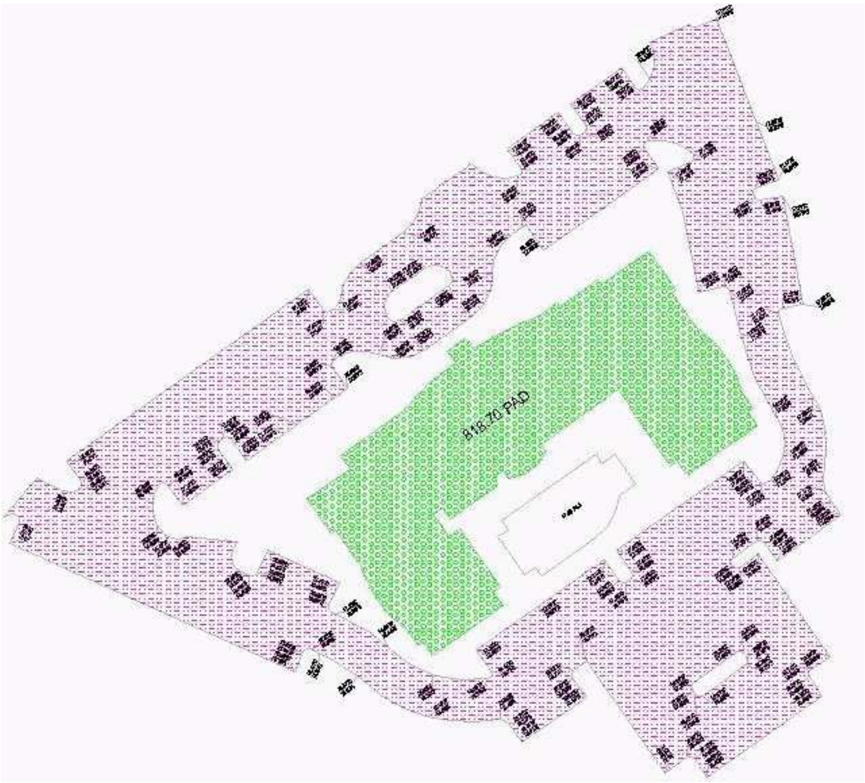
Keyboard Command: erase_aoi_labels
Prerequisite: hatched area of interest

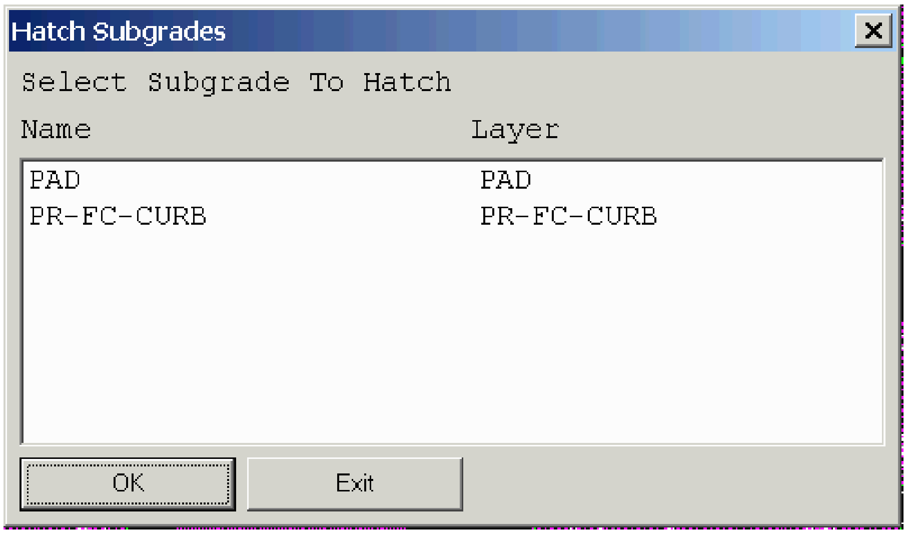
Hatch Subgrade Areas

This command draws a hatch with a specified color and pattern for the area that the selected subgrade area applies to. The purpose is to allow you to visually review a subgrade area to make sure that the area coverage is correct.

The command displays a dialog to select which subgrade to hatch. The list of available subgrades comes from the layers with subgrade depths as set in the Define Layer Target/Material/Subgrade command. Then there is a dialog for the hatch pattern, color and scale. The scale determines how spread out the pattern is within the hatch. The Automatic Hatch Scale option checks the size of the subgrade areas and sets the scale to make the pattern fit.

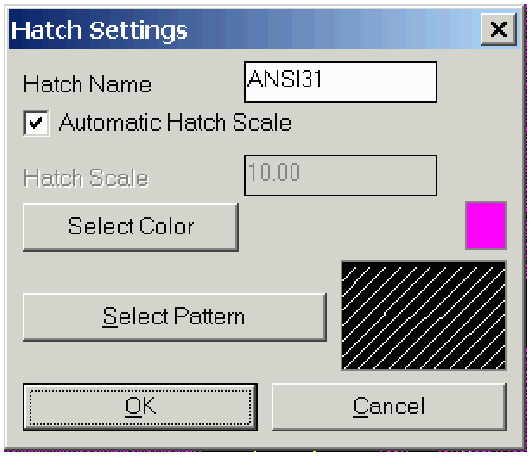
The resulting hatch areas show where the subgrade is applied. In the example below, notice how the islands are not hatched because they are curb polylines that are already inside another curb polyline. Also note that the smaller pad area is not hatched because this polyline layer is different than the bigger pad polyline.




Hatch Subgrades
OK
Exit

Select Subgrade To Hatch

Name	Layer
PAD	PAD
PR-FC-CURB	PR-FC-CURB



Hatch Name: ANSI31

☑ Automatic Hatch Scale

Hatch Scale: 10.00

Pulldown Menu Location: Takeoff > Subgrade Areas
Keyboard Command: hatch_subgrade
Prerequisite: subgrades

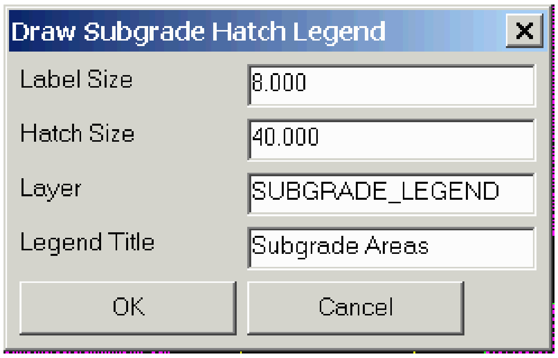
Erase Subgrade Hatches

This command removes from the screen the subgrade hatches created by the commandHatch Subgrade Area.

Keyboard Command: erase_subgrade
Prerequisite: hatch subgrade areas

Draw Subgrade Hatch Legend

This command draws a legend for the subgrade areas currently in the drawing. The legend includes the subgrade names and squares of the hatch patterns. The size of the labels, size of the hatch squares, layer for the legend entities and the legend title are set in the dialog shown below. The subgrade hatches to include in the legend are automatically selected from all the subgrade hatches currently in the drawing that were created by the Hatch Subgrade Areas command.



Label Size: 8.000

Hatch Size: 40.000

Layer: SUBGRADE_LEGEND

Legend Title: Subgrade Areas

Pulldown Menu Location: Takeoff > Subgrade Areas
Keyboard Command: draw_subgrade_legend
Prerequisite: hatched subgrade areas

Report Subgrade Areas

This command reports all the subgrade areas in the drawing. For each subgrade polyline, the report includes the layer name, subgrade depth, area and polyline starting point.

Sample Report:

```
Layer Depth Area Starting Point
PAD 1.500 21979.7 6135018.84,2190093.71
CURB 1.000 50420.2 6134994.81,2190125.80
CURB 1.000 114507.3 6135191.33,2190335.27
```

Pull-Down Menu Location: Takeoff > Subgrade Areas
Keyboard Command: report_subgrade
Prerequisite: Subgrade Areas

Label Subgrade Areas

This command lets you label the subgrade depth and area (in sq. ft. or meters). The label is placed at the center of the subgrade area, but can be moved with the Move command under Edit.

Pull-Down Menu Location: Takeoff > Subgrade Areas
Keyboard Command: label_subgrade
Prerequisite: Subgrade Areas

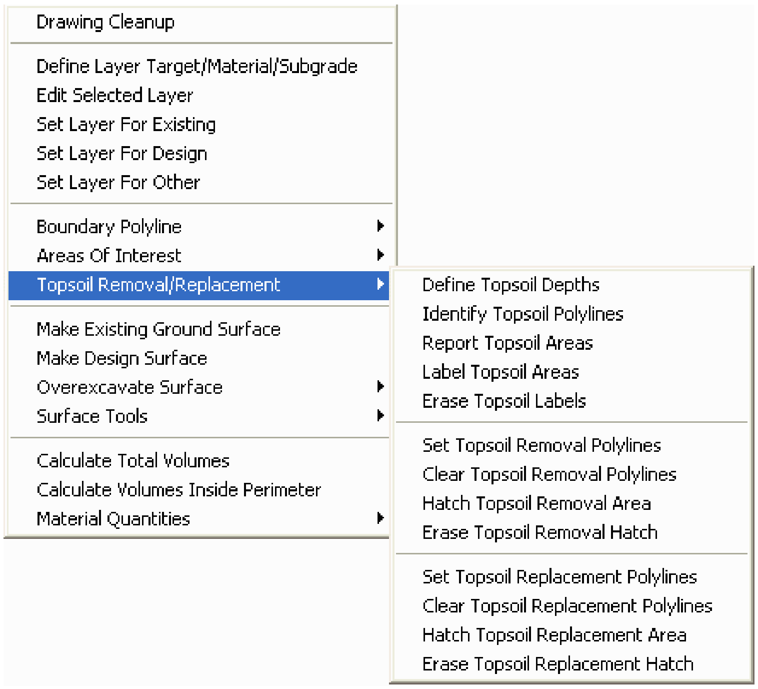
Erase Subgrade Labels

This command erases subgrade labels.

Pull-Down Menu Location: Inquiry-> Subgrade Areas
Keyboard Command: erase_subgrade_labels
Prerequisite: subgrade labels

Topsoil Removal and Replacement

The Topsoil Removal and Replacement options (shown here) allow the user to Define Topsoil removal and replacement depths, Set topsoil removal and replacement areas by selecting closed polylines, Clear the selected boundary polylines if needed, Hatch the topsoil removal and replacement areas and Erase the hatched areas.


Drawing Cleanup
Define Layer Target/Material/Subgrade
Edit Selected Layer
Set Layer For Existing
Set Layer For Design
Set Layer For Other
Boundary Polyline
Areas Of Interest
Topsoil Removal/Replacement
Make Existing Ground Surface
Make Design Surface
Overexcavate Surface
Surface Tools
Calculate Total Volumes
Calculate Volumes Inside Perimeter
Material Quantities
Define Topsoil Depths
Identify Topsoil Polylines
Report Topsoil Areas
Label Topsoil Areas
Erase Topsoil Labels
Set Topsoil Removal Polylines
Clear Topsoil Removal Polylines
Hatch Topsoil Removal Area
Erase Topsoil Removal Hatch
Set Topsoil Replacement Polylines
Clear Topsoil Replacement Polylines
Hatch Topsoil Replacement Area
Erase Topsoil Replacement Hatch

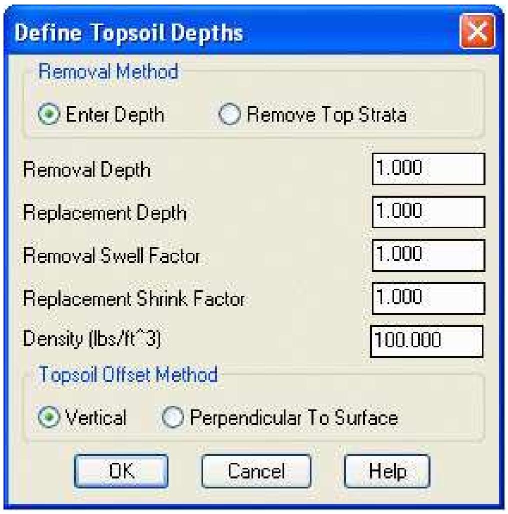
Define Topsoil Depths

This command requires user input to define the depth, or strata, of topsoil removal and replacement. Fill in the options available in the Define Topsoil Depths dialog (shown here). Carlson Takeoff will perform four functions with these values. First, the value set for the Removal Depth, or the Top Strata if selected, will be the "defined" removal amount from the Existing Ground Surface. Second, the calculated volume of topsoil removed will be included in the reporting options. Third, the value set for the Replacement Depth will be added "BELOW" the Finished Ground Surface model. Fourth, the amount of topsoil replaced will be included in the reporting options.

When topsoil depths are defined, the volume report routines will include the topsoil quantities. These topsoil quantities are in addition to the cut/fill for the existing to design surfaces for the site.

The Removal Swell Factor and Replacement Shrink Factor are multiplied by the topsoil removal and replacement quantities respectively in the volume report routines. The Density is used to report topsoil tons when the volume report option for tons is active.

The Topsoil Offset Method choose between offsetting the topsoil depth vertically or perpendicular to the surface. The perpendicular method will result in more topsoil quantities since it represents applying the topsoil depth to the slope area of the surface whereas the vertical method represents applying the topsoil depth to the horizontal area.


Define Topsoil Depths
Removal Method
Enter Depth
Remove Top Strata
Topsoil Offset Method
Vertical
Perpendicular To Surface
OK
Cancel
Help

● Enter Depth ○ Remove Top Strata

Removal Depth 1.000
Replacement Depth 1.000
Removal Swell Factor 1.000
Replacement Shrink Factor 1.000
Density (lbs/ft^3) 100.000

● Vertical ○ Perpendicular To Surface

Prerequisite: topsoil depths
Keyboard Command: define_topsoil

Identify Topsoil Polylines

This command allows users to identify topsoil polylines by either picking on a polyline(s) or by searching the entire drawing. The command will then report the layer name and starting point for both removal and replacement polylines. These polylines are also highlighted in the plain view.

Prerequisite: topsoil polylines
Keyboard Command: id_topsoil

Report Topsoil Areas

Use this command to report the Inclusion or Exclusion area (SF), the type, the depth, the layer, and the starting point.

Prerequisite: topsoil areas
Keyboard Command: report_topsoil

Label Topsoil Areas

This command labels the topsoil type and area in the plain view.

Prerequisite: topsoil area
Keyboard Command: label_topsoil

Erase Topsoil Labels

This command erases topsoil labeling.

Prerequisite: hatched topsoil
Keyboard Command: erase_topsoil_labels

Set Topsoil Removal Polylines

Use this command to select the "CLOSED" polyline boundary defining the extents of topsoil removal and any "CLOSED" interior polylines that define the topsoil removal area. The layer names for these boundaries is irrelevant. You will be prompted to use the Removal Depth defined in the Define Topsoil Depths command or to customize your depth.

Prerequisite: polylines for removal
Keyboard Command: tag_topsoil_remove

Clear Topsoil Removal Polylines

This command allows the user to remove and previously selected Topsoil Removal Polyline boundaries.

Prerequisite: topsoil polylines
Keyboard Command: untag_topsoil_remove

Hatch Topsoil Removal Area

Use this command to display a hatch pattern over the entire area designated for topsoil removal.

Prerequisite: topsoil areas
Keyboard Command: hatch_topsoil_remove

Erase Topsoil Removal Hatch

Use this command to remove the hatch pattern that defined the topsoil removal area.

Prerequisite: hatched topsoil
Keyboard Command: erase_topsoil_remove

Set Topsoil Replacement Polylines

Use this command to select the "CLOSED" polyline boundary defining the extents of topsoil replacement, and any "CLOSED" interior polylines that define the topsoil replacement. The layer names for these boundaries is irrelevant. You will be prompted to use the Topsoil Replacement amount defined in the Define Topsoil Depths command or to customize your amount.

Prerequisite: polylines for replacement
Keyboard Command: tag_topsoil_replace

Clear Topsoil Replacement Polylines

This command allows the user to remove and previously selected Topsoil Replacement Polyline boundaries.

Prerequisite: topsoil polylines
Keyboard Command: untag_topsoil_replace

Hatch Topsoil Replacement Area

Use this command to display a hatch pattern over the entire area designated for topsoil replacement.

Prerequisite: topsoil areas
Keyboard Command: hatch_topsoil_replace

Erase Topsoil Replacement Hatch

Use this command to remove the hatch pattern that defined the topsoil replacement area.

Prerequisite: hatched topsoil
Keyboard Command: erase_topsoil_replace

Special Fill Areas

Special Fill Areas can be used to identify areas to report fill separately. This can be used for areas were a different type of fill is needed. Such as under a building pad. The Special Fill Areas perimeters are defined by user-selected closed polylines. Carlson Takeoff will separate the special fill volume within the Calculate Total Volume Report.

Tag Special Fill Area

This command allows the user to select perimeter polylines that define special fill areas. Note: The inclusion and exclusion polylines are selected at the same time. The polyline to the inside will be used as an exclusion polyline.

Untag Special Fill Area

This command allows the user to remove previously tagged Special Fill areas.

Identify Special Fill Area

This command allows the user to identify Special Fill Areas by either picking on a polyline(s) or by searching the entire drawing. The command line report the layer, starting point, and highlight the polyline(s) in the plan view.

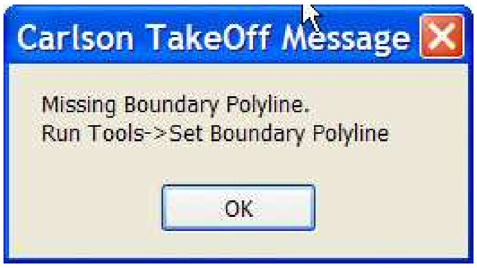
Pulldown Menu Location: Takeoff
Prerequisite: Closed polylines that represent Special Fill Areas
Keyboard Command: tag_special_area, untag_special_area, id_special_area

Make Existing Ground Surface

This command makes the triangulation models for the existing ground surface. There are three surfaces that are created: initial original ground (og), original ground after applying subgrade zones (ze), and original ground after subgrade zones and topsoil removal (ex). These surface files are automatically named as "filename-og.tin", "filename-ze.tin" and "filename-ex.tin" respectively. The "filename" is set to the name of the current drawing (dwg) file. Also, the file extension will be .tin for the binary format triangulation and .flt for the ASCII format triangulation. This file format is set in Configure->Takeoff.

The surface is built using 3D entities in the drawing on the layers define in Define Layer Target/Material/Subgrade command. Also, the surface elevation for any drillholes are used for the model. The subgrade zones are defined in the Define Layer Target/Material/Subgrade command. If there aren't any subgrade zones for the Existing surface, then the original ground after subgrades surface with be the same as the initial original ground surface. The topsoil removal depths and areas are set with the commands in the Topsoil Removal/Replacement sub-menu. The topsoil removal areas will lower the ground surface by the topsoil depth. If there aren't any topsoil removal areas, then the original ground after subgrade and topsoil surface will be the same as the original ground after subgrade surface.

Before running this command, the layer names for the entities on the Existing layer target must be set in the Define Layer Target/Material/Subgrade command. Also these entities must be at their proper elevations. The entity elevations can be reviewed using commands from the Inquiry menu and the elevations can be assigned if needed using command from the Elevate menu. Another prerequisite is that the Boundary Polyline must be set for the site. If the boundary has not been set, the following error message will appear.

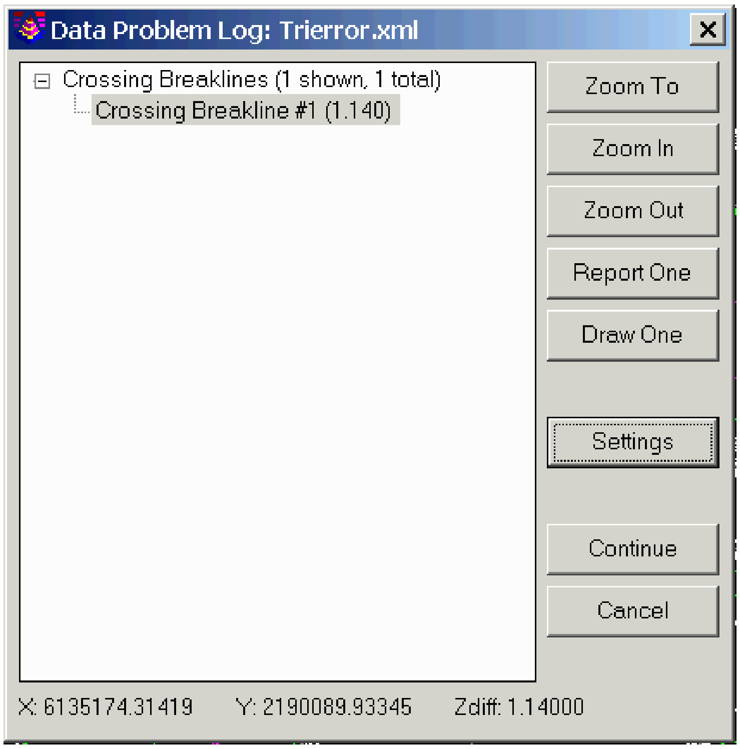


Missing Boundary Polyline.
Run Tools->Set Boundary Polyline

If this error message appears, run the "Set Boundary Polyline" command and pick the CLOSED polyline representing the boundary of the site.

When the program finds errors in the existing entities, a Data Error Log dialog reports these errors. Three types of conflicts are reported: Crossing Breaklines, Vertical Edges, and Breakline T-Intersections. Crossing Breaklines indicates that the intersection of two entities does not have a common elevation. Vertical Edges indicates that two entities or vertices of differing elevations have the same x-y location, thus forming a vertical plane. Breakline T-Intersections indicates that a 3d entity is abutting another entity, but the second entity doesn't have a vertex at the point of intersection. Each type of conflict is listed in its own category.

The Data Error Log shows the amount of elevation difference at each error. You can use the Data Error Log to review, report and draw markers at these error locations. Then you can exit the Data Error Log and fix the data errors with the commands in the Elevate menu or other drafting tools. After these errors are fixed, you can run Make Existing Ground Surface again.



Crossing Breaklines (1 shown, 1 total)
Crossing Breakline #1 (1.140)

X: 6135174.31419 Y: 2190089.93345 Zdiff: 1.14000

Clicking to the "plus" sign beside a category will display the individual conflicts within that category. When a line item error is selected, a highlighted arrow is temporarily placed in the drawing to indicate the exact location of the specific conflict. Zoom functionality allows the user to more closely inspect the specific problem area, and if needed a marker can be drawn or a report generated for an individual conflict or conflicts.
Zoom To pans the drawing to move the selected conflict to the center of the screen. The zoom functions are only active when a single line item is selected.

Zoom In zooms in on the highlighted area for closer inspection**.** Multiple picks on the zoom button will increase the magnification.

Zoom Out zooms out away from the highlighted area.

Report All/One toggles between One and All depending whether a single line item conflict or a category is selected from the error log. An error report is generated listing the x-y position and the elevation difference of the entities in conflict.

Draw All/One toggles between One and All depending whether a single conflict or a category is selected from the list. This option draws an "X" symbol at each selected conflict. The layer and size of the symbol is controlled in the fields below.

Continue closes the Error Log and proceeds with the contouring operation.

Settings has controls for the tolerances for error reporting and for the Layer Name and Symbol Size to use with the Draw function.

Keyboard Command: mk_exist_tin
Prerequisite: a boundary polyline and elevated entities on the Existing layer target

Make Design Surface

This command makes the triangulation models for the design surface. There are three surfaces that are created: initial unadjusted design (bs), design after applying subgrade zones (zn), and design after subgrade zones and topsoil replacement (fn). These surface files are automatically named as "filename-bs.tin", "filename-zn.tin" and "filename-fn.tin" respectively. The "filename" is set to the name of the current drawing (dwg) file. Also, the file extension will be .tin for the binary format triangulation and .flt for the ASCII format triangulation. This file format is set in Configure->Takeoff. The subgrade zones are defined in the Define Layer Target/Material/Subgrade command. If there aren't any subgrade zones for the Design surface, then the design after subgrades surface with be the same as the initial design surface. The topsoil replacement depths and areas are set with the commands in the Topsoil Removal/Replacement sub-menu. The topsoil replacement areas will lower the design surface by the topsoil depth to leave room for the topsoil replacement. If there aren't any topsoil replacement areas, then the design after subgrade and topsoil surface will be the same as the design after subgrade surface.

Before running this command, the layer names for the entities on the Design layer target must be set in the Define Layer Target/Material/Subgrade command. Also these entities must be at their proper elevations. The entity elevations can be reviewed using commands from the Inquiry menu and the elevations can be assigned if needed using command from the Elevate menu. Another prerequisite is that the Boundary Polyline must be set for the site.

When the program finds errors in the existing entities, a Data Error Log dialog reports these errors. Refer to the Make Existing Surface command for more information on the Data Error Log dialog.

Keyboard Command: mk_final_tin
Prerequisite: a boundary polyline and elevated entities on the Existing layer target

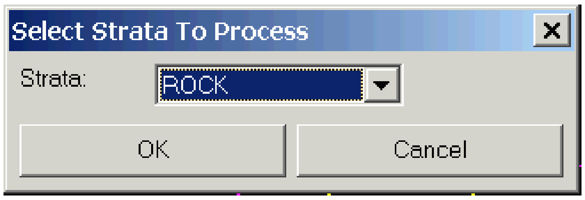
View Overexcavate Surface

Use this command to view the current overexcavate surface. The Takeoff 3D Viewer will display the 3D faces of the adjusted surface. Shade the 3D model and adjust its perspective to view a rendered display. The surface that is displayed will depend on the latest surface created using the make and adjust routines.

Prerequisite: an overexcavate surface
Keyboard Command: cube_overx

Make Overexcavate Surface From Strata

This command sets the Overexcavate surface to a selected strata surface. Before running this command, the strata surface must be created with the Make Strata Surfaces command in the Drillhole menu. The resulting overexcavate surface is stored in a triangulation file that is named with "-ox" appended to the current drawing name.



Strata: ROCK

Prerequisite: Strata surfaces
Keyboard Command: overx_by_strata

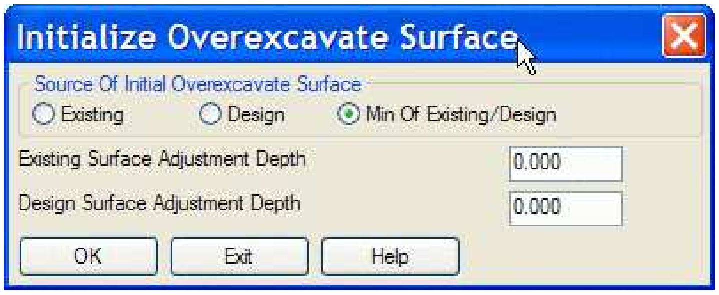
Make Overexcavate Surface From Screen Entities

This command makes the overexcavate surface from entities on the layers defined as Overexcavate in the Define Layer Target/Material/Subgrade command. The resulting surface of Make Overexcavate Surface is stored in a triangulation file that is named with "-ox" appended to the current drawing name.

Prerequisite: overexcavate entities
Keyboard Command: mk_overx_tin

Make Overexcate Surface From Existing/Design Surfaces

The Initialize Overexcavation Surfaced dialog box shown here allows the user to select which surface model to overexcavate and to enter in the depth value for the desired adjustment. Use the Min Existing/Design option to set the overexcavate as the minimum of the existing and design surfaces. If a single surface is selected the value entered will be applied to that surface only. The resulting surface of Make Overexcavate Surface is stored in a triangulation file that is named with "-ox" appended to the current drawing name.


Initialize Overexcavate Surface

Source Of Initial Overexcavate Surface
○ Existing ○ Design ● Min Of Existing/Design

Existing Surface Adjustment Depth: 0.000
Design Surface Adjustment Depth: 0.000

Prerequisite: Existing and/or Design surfaces
Keyboard Command: set_overx

Adjust Overexcavate Surface

This command adjusts the overexcavate surface vertically within the selected perimeter polylines. This command allows the site to be overexcavated at a variety of depths in specified areas represented with CLOSED polyline boundaries. Select the desired areas to be adjusted when prompted at the command line.

Keyboard Command: adjust_overx
Prerequisite: an overexcavate surface

Draw Overexcavate Surface 3D Faces

Use this command to draw the 3D faces of the overexcavated surface model on the screen. The 3D faces will be drawn in the TK_OVERX_SURFACE layer and will depend on the latest surface created using the make and adjust routines.

Prerequisite: An overexcavate surface
Keyboard Command: draw_overx

Erase Overexcavate Surface 3D Faces

Use this command to remove the previously drawn 3D Faces from the screen.

Prerequisite: 3D Faces

Keyboard Command: erase_overx

Draw Overexcavate Cut Color Map

Use this command to display a cut color map on the screen that shows the areas of overexcavate cut. The colors will graduate from white to red based on zero cut depth to maximum cut depth. This command also offers the user to place a legend of the cut depths on the screen. Pick the desired location and type the desired scale of the legend when prompted at the command line.

Prerequisite: An overexcavate surface
Keyboard Command: overx_cfmap

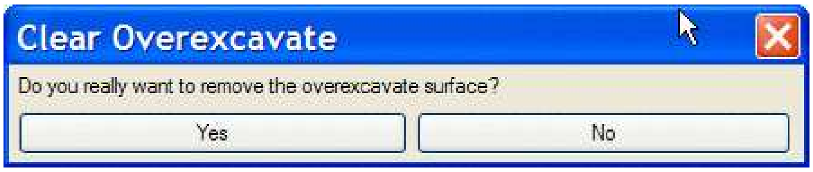
Erase Overexcavate Cut Color Map

Use this command to remove the previously drawn Cut Color Map and Legend from the screen.

Prerequisite: An overexcavate cut color map
Keyboard Command: overx_cfmap2

Clear Overexcavate Surface

Use this command to remove the overexcavate surface. When the overexcavate surface is removed, the rest of the Takeoff commands will not calculate overexcavate volumes. You will be prompted to confirm before the remove is done.



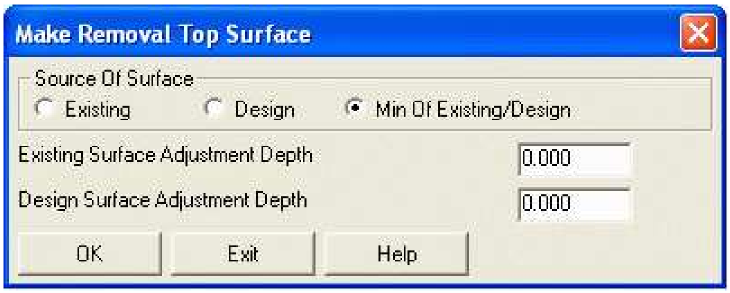
Do you really want to remove the overexcavate surface?

Pulldown Menu Location: Takeoff > Overexcavate Surface
Prerequisite: An overexcavate surface
Keyboard Command: clear_overx

Make Top Surface

From Existing/Design Surfaces

This command sets the top Overexcavate surface (dwgname-rm.tin) that will be compared to a bottom Overexcavate surface for removal volumes. In the below dialog, Existing and Design surfaces created in Takeoff can be used as the top Overexcavate surface. Min Of Existing/Design is the minimum, or lowest grade, between the Existing and Design surfaces. Adjustment Depth allows you to drop either the Existing or Design surface by a specified amount.


Make Removal Top Surface

Source Of Surface
○ Existing ○ Design ● Min Of Existing/Design

Existing Surface Adjustment Depth: 0.000

Design Surface Adjustment Depth: 0.000

Prerequisite: an existing or design surface
Keyboard Command: set_rm_top

From Triangulation Surface File

This routine allows a previously created surface .tin or .flt file to be loaded as the top Overexcavate surface.

Prerequisite: a previously created surface .tin or .flt file
Keyboard Command: rm_top_file

From Screen Entities

This command will create the top Overexcavate surface from entities in the plan view. Entities will need to have elevation such as contours, 3D faces, or elevated polylines.

Prerequisite: screen entities with elevation
Keyboard Command: mk_rm_top

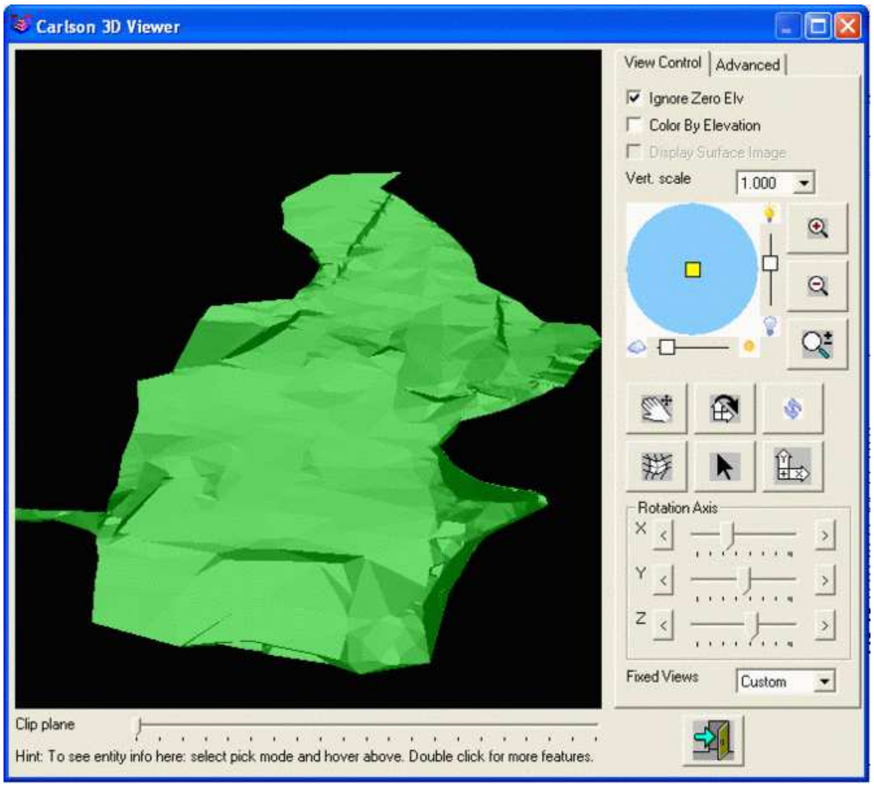
Make Removal Surface

This command makes the triangulation models for the Removal Surfaces. The surface is automatically named as "filename-removalname.tin". The "filename" is set to the name of the current drawing (dwg) file. The "removalname" is determined by the Removal Area current in the Removal Manager. Before running this command, you must have a current Removal Area with elevated entities. Another prerequisite is that the Removal Boundary must be set for the site.

Keyboard Command: mk_rm_overx
Prerequisite: Removal Entities and a Removal Boundary

View Top Surface

This command allows you to view the top Overexcavate surface in 3D mode.



☑ Ignore Zero Elv
☐ Color By Elevation
☐ Display Surface Image
Vert. scale 1.000

Rotation Axis
X
Y
Z
Fixed Views Custom
Clip plane

Hint: To see entity info here: select pick mode and hover above. Double click for more features.

In the top right of the control bar you can check to Ignore Zero Elev and Color By Elevation and change the Vertical Scale. If you increase the Vertical Scale than elevation differences can be seen easier. Ignore Zero Elev does not display elevations of zero in the 3D viewer. Color By Elevation shows elevation change with the change of colors. Note: Color By Elevation is used in the above example. To adjust the color use the color circle on the right.

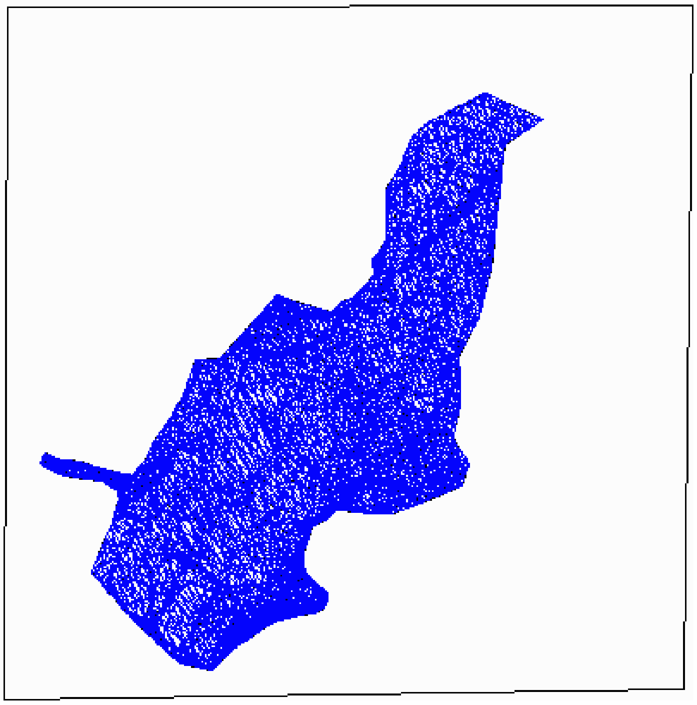
The magnify glass icons can be used to zoom in and out. Click on the plus magnify glass to zoom in and the minus magnify glass to zoom out. With the icon click and drag up to zoom in and drag down to zoom out. The hand icon below the color circle allows you to pan around the viewer. Click and drag the direction you want to move. The icon can be used to rotate the vantage point of the viewer by the x, y, or z axis. When you move the cursor to the screen it will change into a x, y symbol or a z symbol. Move the cursor around to move it from one to the other. If you have the x, y cursor move right or left to change the x axis view, or to change the y move the cursor up or down. If you have the z cursor than move it in a circular fashion to rotate the view point according to the z axis. The icon toggles on and off the shading of the surface (the shading is shown in the above drawing). The arrow icon reports the elevations at the bottom of the screen as you move around the surface. The icon restores the surface viewpoint to flat. The icon exits 3D Driver Simulation.

Rotation Axis: These three control bars rotate the surface around the x, y, and z axis. Clip plane trims the size of the surface shown in the viewer.

Prerequisite: a top Overexcavate surface
Keyboard Command: cube_rm_top

Draw Top Surface 3D Faces

This command will display the top Overexcavate surface as 3D faces in the plan view.

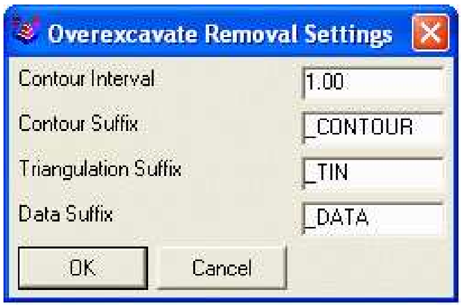


Keyboard Command: draw_rm_top
Prerequisite: Make Top Surface
This command will erase the plan view entities created in Draw Top Surface 3D Faces.

Keyboard Command: erase_rm_top
Prerequisite: Draw Top Surface 3D Faces

Removal Settings

This command sets the layers suffixes for the entities created in the commands Draw Removal Surface and Draw Removal Contours. These Surfaces are added to the Removal Area names. For example, if Topo2 is set to Current in the Removal Manager, Draw Removal Surface will create 3D faces on the layer Topo2_TIN. Likewise, Draw Removal Contour will create contours on the layer Topo2_CONTOUR. The interval that the contours are drawn are also set here.

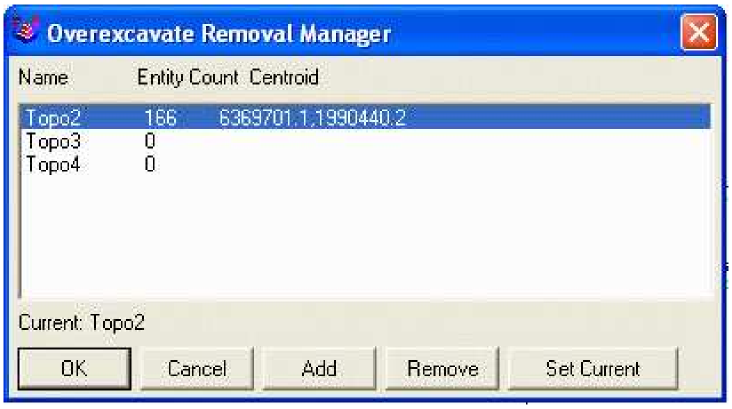


Contour Interval: 1.00
Contour Suffix: _CONTOUR
Triangulation Suffix: _TIN
Data Suffix: _DATA

Prerequisite: none
Keyboard Command: rm_overx_setup

Removal Manager

In Removal Manager command every Removal Area in a project and the entities that define them is displayed as well as the Centroid (center coordinate) for that Area. Add allows you to name and create a new Removal Area. Remove will delete the Removal Area. When a Removal Area is set to Current, it will be used by other Removal commands when processing.



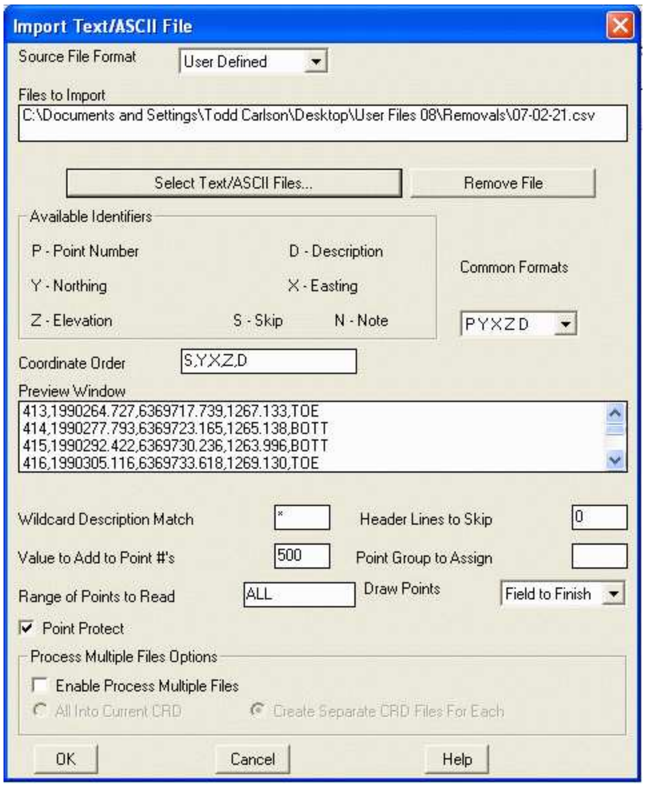
Name	Entity Count	Centroid
Topo2	166	6369701.1,1990440.2
Topo3	0	
Topo4	0	

Current: Topo2

Prerequisite: none
Keyboard Command: rm_overx_mgr

Import Removal Text ASCII File

This command converts point data from an ASCII text file into the current Carlson coordinate (.CRD) file. The points brought in with this command will be assigned to the Current Removal Area if Draw Points is set to Points or Field-to-Finish. Each line of the text file can contain any combination of point number, northing, easting, elevation and description. All point information should be on one line with the values separated by a comma, space or other delimiter. Under the Source File Format setting you can choose from some specific formats or User-Defined. For User-Defined, the format of the text file is specified in the Coordinate Order field where the value identifiers are listed with the appropriate delimiters.



Source File Format: User Defined

Files to Import: C:\Documents and Settings\Todd Carlson\Desktop\User Files 08\Removals\07-02-21.csv

Common Formats: PYXZD

Coordinate Order: S,YXZ,D

Preview Window:

```
413,1990264.727,6369717.739,1267.133,TOE
414,1990277.793,6369723.165,1265.138,BOTT
415,1990292.422,6369730.236,1263.996,BOTT
416,1990305.116,6369733.618,1269.130,TOE
```

Wildcard Description Match: *

Header Lines to Skip: 0

Value to Add to Point #'s: 500

Point Group to Assign:

Range of Points to Read: ALL

Draw Points: Field to Finish

☑ Point Protect

Process Multiple Files Options

☐ Enable Process Multiple Files

○ All Into Current CRD ● Create Separate CRD Files For Each

Common formats can be selected from the Common Format List. All the lines in the text file should contain only point data and any header lines should be removed. To read the text file, pick the Select Text/ASCII File button and choose the file to read. Then the selected file is displayed in the Preview Window to help with filling out the Coordinate Order. When the Coordinate Order is set, click OK to read the text file. The Wild Card Descriptions Match allows for only point with matchingdescriptions to be imported. With Point Protect active, the program will check if a point number already exists in the CRD before importing the point. If a point conflict is found, you can either assign a new point number or overwrite the old point. The Value to Add to Point Numbers allows you to renumber the points as they are imported. The Header Lines to Skip value is the number of lines not to be processed at the start of the text file. The Point Group To Assign option will create a point group with the specified name for the coordinate file containing the point numbers imported with Import Text/ASCII File. Special formats can be directly imported by choosing that File Format at the top of the dialog.

Prerequisite: Text/ASCII File and a Removal Area created and set to Current
Keyboard Command: rm_overx_mgr

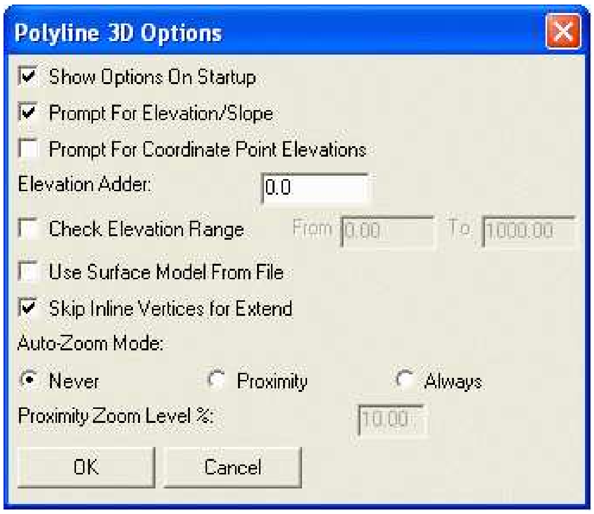
Draw Removal Field to Finish

This command turns data collector field notes into Removal Area points and linework by matching the descriptions of the field points with user-defined codes.Two files are used in Field-to-Finish - a coordinate file and a field code definition file. For more on these files and their settings see Draw Field-to-Finish under Survey.

Keyboard Command: rm_overx_f2f
Prerequisite: A data file of points with descriptions and a Removal Area created and set to Current

Draw Removal Breakline

This command allows you to draw 3D linework for the Current Removal Area.



☑ Show Options On Startup
☑ Prompt For Elevation/Slope
☐ Prompt For Coordinate Point Elevations
Elevation Adder: 0.0
☐ Check Elevation Range From 0.00 To 1000.00
☐ Use Surface Model From File
☑ Skip Inline Vertices for Extend
Auto-Zoom Mode:
● Never ○ Proximity ○ Always
Proximity Zoom Level %: 10.00

The Show Options on Startup dialog will appear every time the command is run, unless this is turned off. If it is off, then the last settings will apply. To get the box back, choose O for Options.

Prompt for Elevation/Slope controls whether the elevation of each picked point will be entered in, or hit S for slope to draw a slope line.

Use Surface Model from File will use a grid or triangulation file as a surface model. Wherever the points are picked on the surface, the elevation of the surface will be assigned to the polyline.

There are 3 options under Auto-Zoom Mode. Never will not zoom to the last point picked. Proximity will zoom to the percent proximity set below. Always will always zoom center on every point.

If the Proximity Auto-Zoom mode is checked, the percent of the proximity is set in the Proximity Zoom Level% box.

Keyboard Command: rm_overx_3dp
Prerequisite: a Removal Area set to Current

Removal Entities

Tag Removal Entities

This command allows the user to select polylines and points that define the Current Removal Area. Carlson Takeoff will separate each Removal Area in the Calculate Removals Volumes Report.

Prerequisite: linework and/or points intended for the Current Removal Area
Keyboard Command: tag_rm_overx

ID Removal Entities

This command allows users to identify Removal Entities by either picking on a polyline(s) or by searching the entire drawing. The command will then highlight the polyline in the plan view.

Prerequisite: Tag Removal Entities
Keyboard Command: id_rm_overx

Untag Removal

This command allows the user to remove previously tagged Removal Entities.

Prerequisite: Tag Removal Entities
Keyboard Command: untag_rm_overx

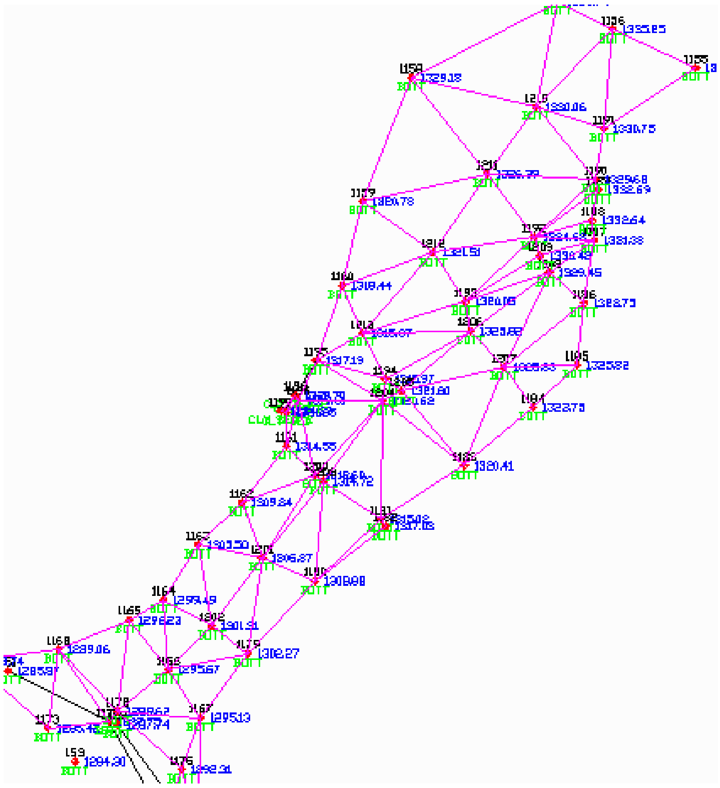
Set Removal Boundary

Use this command to select the "CLOSED" polyline that defines the outer most limit of the Current Removal Area. This boundary should dissect the site at the point where the Current Removal Entities end. Volume calculation will take place inside this boundary.

Prerequisite: a closed polyline
Keyboard Command: rm_overx_perim

Draw Removal Surface

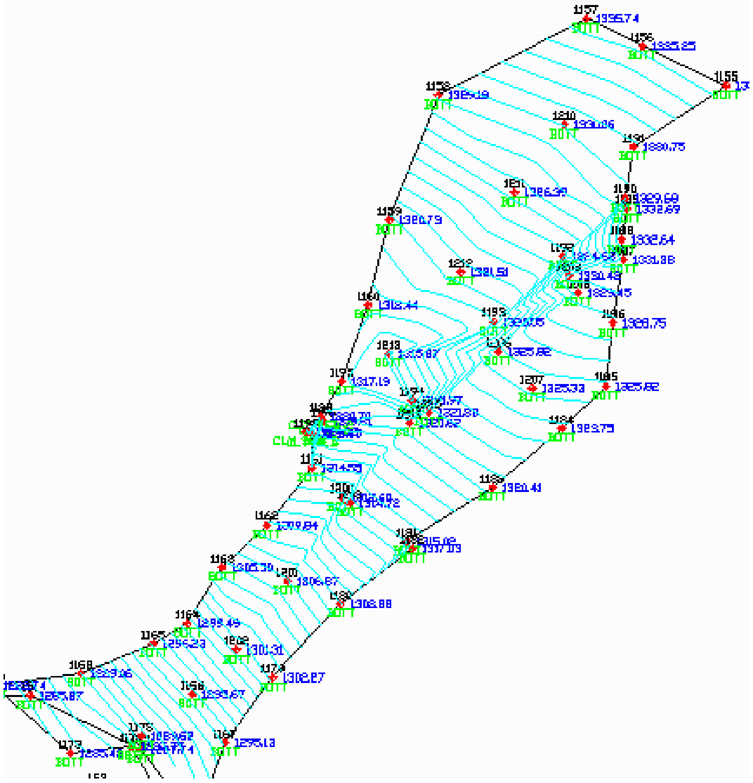
This command draws the current Removal Surface as 3D faces in the plan view.



Keyboard Command: draw_rm_overx_tin
Prerequisite: Make Removal Surface

Draw Removal Contours

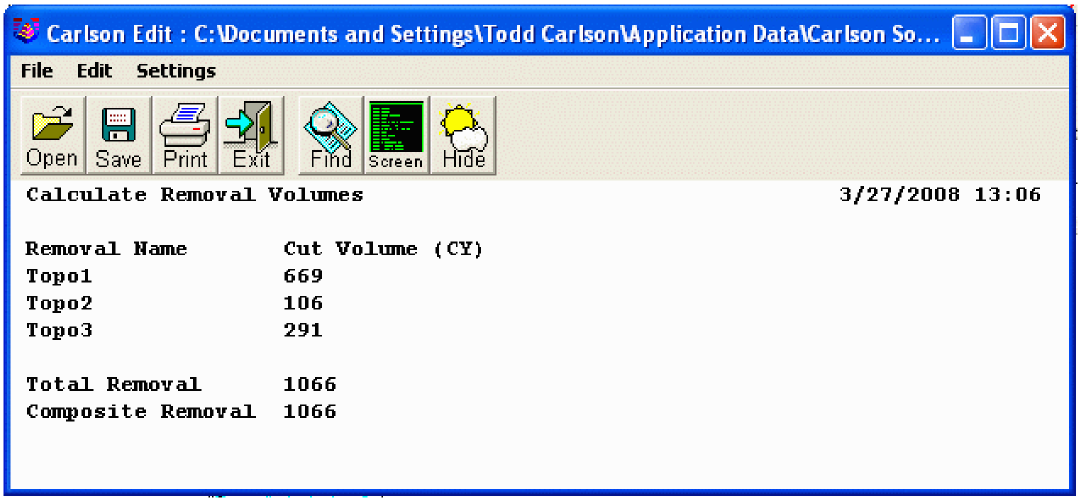
This command displays all the contours that represent current Removal Surface. They are created off of the Removal Area .tin model. For contour interval, see Removal Settings.



Keyboard Command: draw_rm_overx_ctr
Prerequisite: Make Removal Surface

Calculate Removals Volumes

This command reports the volumes in cubic yards for each Removal Area against the Top Removal Surface. The volumes are given for each area as well as a total for all the areas. Calculate Removal Volumes then creates and reports a Composite Surface against the Top Removal Surface taking the lowest grade in overlapping Removal Areas.



Carlson Edit : C:\Documents and Settings\Todd Carlson\Application Data\Carlson So...
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

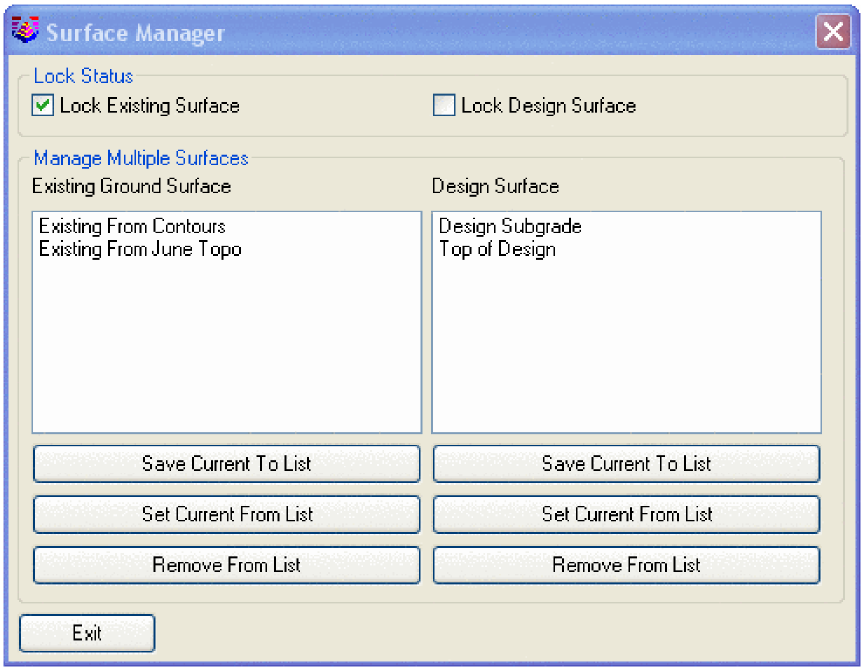
```
Calculate Removal Volumes                               3/27/2008 13:06

Removal Name        Cut Volume (CY)
Topo1               669
Topo2               106
Topo3               291

Total Removal       1066
Composite Removal   1066
```

From the Standard Report Viewer, you can Save, Print, or place on the Screen the volume numbers. You can also type your own text into the report.

Keyboard Command: calc_rm_overx
Prerequisite: Make Top Surface and Make Removal Surface

Surface Manager

This command allows the user to name and manage multiple surface models. The Surface Manager dialog shown here has options to name and save the current "existing and design" surface models. The "current" surface is dictated by the layers that populate a target and the Make Surface command. If layers are removed from a target, and others assigned, multiple surfaces can be created and stored. When the Lock Status is check, the Current Surface will remain current even if you run Takeoff > Make Existing Ground Surface or Make Design Surface. If the Lock Status is uncheck, then Making the Existing or Design Surface will become the current surface, overriding the current surface selected in the Surface Manager. Highlight a named surface and select the Set Current From List option to make that model active. Use the Remove From List option to remove a named surface model from the list.

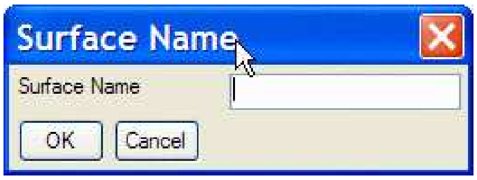


Lock Status
☑ Lock Existing Surface ☐ Lock Design Surface

Manage Multiple Surfaces

Existing Ground Surface	Design Surface
Existing From Contours Existing From June Topo	Design Subgrade Top of Design

Selecting the Save Current To List options brings up the Surface Name dialog box shown here. Type the desired name that describes a particular surface model and select OK.



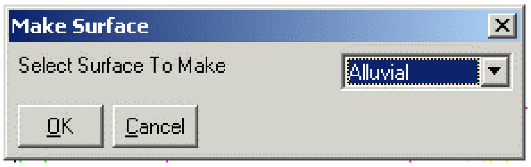
Pulldown Menu Location: Takeoff > Surface Tools
Prerequisite: none
Keyboard Command: surf_mgr

Make User Defined Surface

This command makes a surface from the entities on the layers defined as user-defined targets in the Define Layer Target/Material/Subgrade command. The purpose of user-defined surfaces is for modeling surfaces besides existing ground and design. The drawing needs to contain entities that represent the elevations of the user-defined surface. For example, the user-defined surface could be for alluvial soil and the drawing has contour polylines for this surface.

There is a dialog to select which surface to make. The surface is stored in a triangulation file that is named after the current drawing name with the user-defined surface name appended.

This user-defined surface can be applied to Takeoff routines by running the Set Active Surfaces command.



Select Surface To Make: Alluvial

Pulldown Menu Location: Takeoff > Surface Tools
Prerequisite: Define Layer Target/Material/Subgrade command
Keyboard Command: mk_user_tin

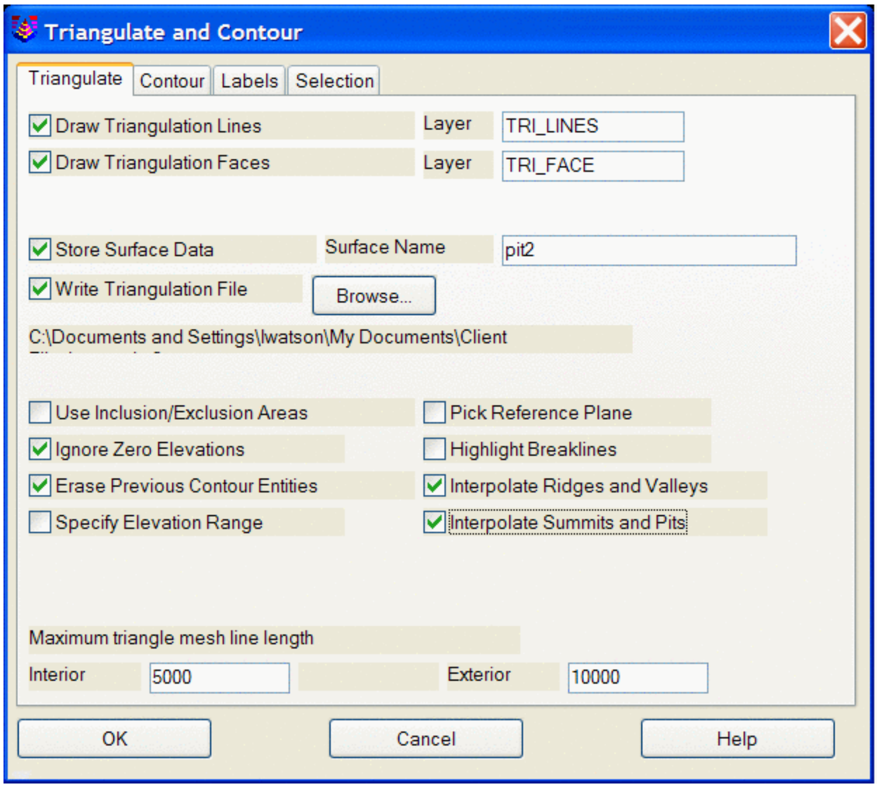
Triangulate and Contour

This command provides all of the functionality related to contouring and creating tin surface models in one routine. Given data entities that represent the surface, this command creates a final contour map with labeled, smoothed, and highlighted contours and/or a surface model that can be saved to a file (to be used in other areas of the program) or drawn on the screen as triangles or faces. Eligible data entities include points, inserts, lines, 2d polylines, 3d polylines, elevation text, 3d faces, and points from ASCII or coordinate (.CRD) files.

Triangulate & Contour has many options which are defined in the exhibits shown in the following pages. With this command, you can do any combination of drawing the triangulation network lines, drawing the contours, drawing triangulation network 3D Faces or lines, writing a triangulation file and storing a surface file.

In order to force *Triangulate & Contour* to correctly interpolate elevations between two points that define a grade break in the surface (such as points on a ridge, wall, or road), a breakline must exist between the points. A breakline line can be specified as a 3D polyline or line. In fact, all 3d polylines and lines with elevation are be treated as breaklines.

Triangulate Tab



☑ Draw Triangulation Lines Layer TRI_LINES
☑ Draw Triangulation Faces Layer TRI_FACE

☑ Store Surface Data Surface Name pit2
☑ Write Triangulation File
C:\Documents and Settings\lwatson\My Documents\Client

☐ Use Inclusion/Exclusion Areas
☑ Ignore Zero Elevations
☑ Erase Previous Contour Entities
☐ Specify Elevation Range
☐ Pick Reference Plane
☐ Highlight Breaklines
☑ Interpolate Ridges and Valleys
☑ Interpolate Summits and Pits

Maximum triangle mesh line length
Interior 5000
Exterior 10000

Draw Triangulation Lines

When this option is turned on, the program will draw the triangulation as 3D lines. Specify the layer for these lines in the box to the right.

Draw Triangulation Faces

When this option is turned on, the program will draw each triangle in the triangulation network as a 3D Face. These 3D Faces can then be used in AutoCAD's modeling routines such as *HIDE* and *SHADE* or in routines such as *3D Viewer Window, 3D Surface FlyOver and Slope Zone Analysis*. Specify the layer for these 3DFaces in the box to the right.

Store Surface Data

This option names and creates a surface or surfaces that are associated with the drawing. The creation of a surface is necessary in order for the Surface Tools to function. A Triangulation file must also be specified before using the Store Surface option.

Write Triangulation File

This option stores the triangulation surface model as an .flt or a .tin file. The .flt file format is a text file depicting the edges in the triangulation network. The .tin file is a new binary file format depicting the triangulation network. The .tin file is much faster and more efficient than the previous .flt file format. The triangulation file/s can be used by several commands such as *Volumes By Triangulation, Spot Elevations, and Profile from FLT File*. Either type in the file name to create or press the Browse button to select a file name.

Use Inclusion/Exclusion Areas

When this box is activated, the program will later prompt you for inclusion and exclusion polylines which are used to trim the contours. The inclusion and exclusion polylines must be closed polylines and must be drawn before starting *Triangulate & Contour*. Only the parts of the contour lines that are within the inclusion polylines will be drawn. For example, an inclusion could be the perimeter of the site. The parts of contour lines that are inside the exclusion polylines are not drawn. Exclusion polylines can be used for areas where you don't want contours such as within buildings.

Ignore Zero Elevations

When activated, this setting will filter out all data points at an elevation of zero from the data set.

Erase Previous Contour Entities

When activated, this setting will erase previously drawn contour entities.

Specify Elevation Range

The program will automatically contour from the lowest elevation in the data set up to the highest at the increment specified in Contour Interval. If you would like to manually set the range over which to contour, select this option.

Pick Reference Plane

The triangulation network is based on the x,y position of the points. This option allows you to contour an overhang or cliff by changing the reference plane to a side view. The reference plane can be specified by first using the *Viewpoint 3D* command and then using the View option, or you can specify three data points on the cliff (two along the bottom and one at the top).

Highlight Breaklines

This option highlights breaklines in the triangulation network by drawing the triangulation lines along breaklines in yellow.

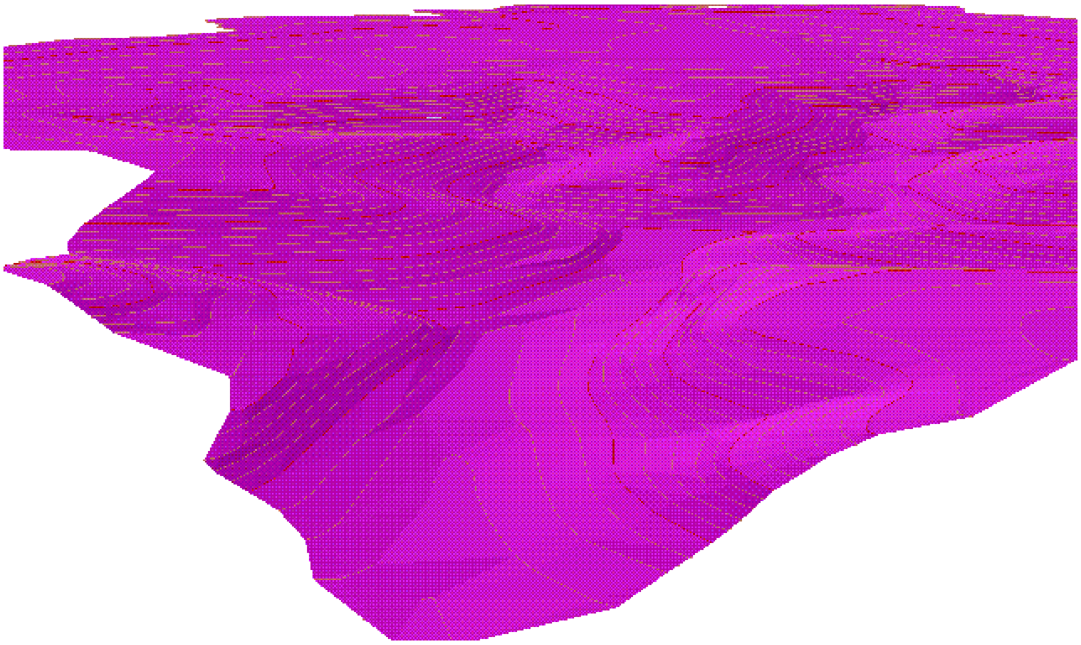
Interpolate Ridges and Valleys

This option creates additional triangulation in a ridge or valley situation to more accurately define the feature during surface modeling operations. This option would commonly be used when creating a surface model from existing contours, since it replaces the need to manually draw 3d polylines along ridges and valleys.

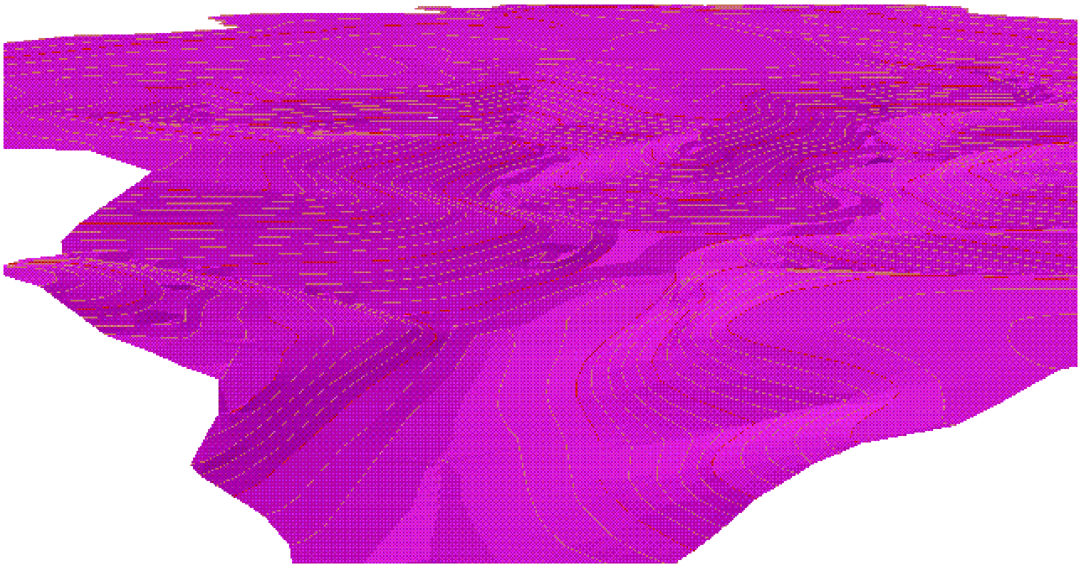
Interpolate Summits and Pits

This option creates additional triangulation in a summit or pit situation to more accurately define the feature during surface modeling operations. This option would commonly be used when creating a surface model from existing contours.

Before: Surface made from an existing contour map. Note the flat spots in the bottom of the valley when Interpolate Ridges and Valleys is disabled.



After: The same surface with Interpolate Ridges and Valleys enabled.

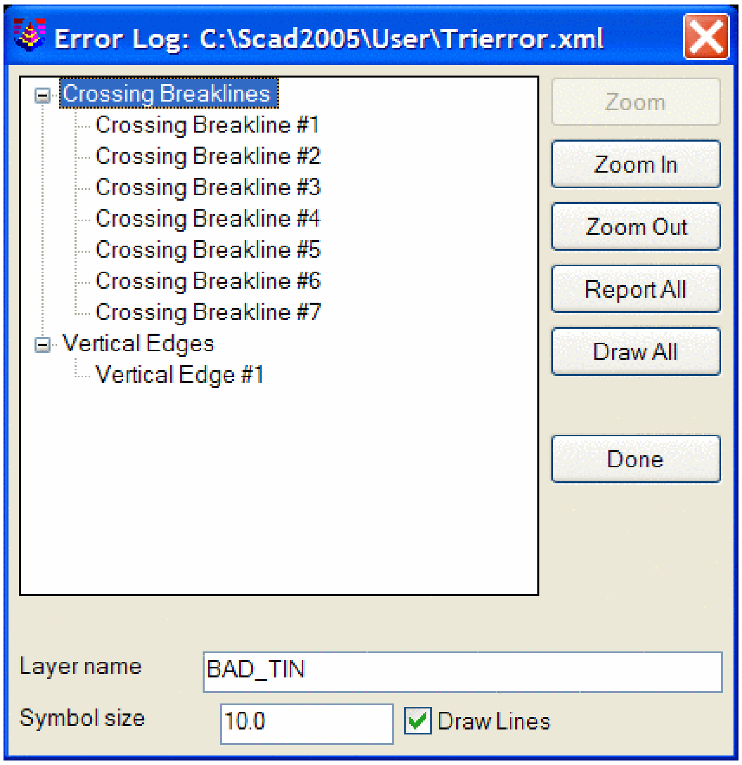


Max Triangle Mesh Line Length

This value limits the length of the triangulation network lines. Any triangulation line that exceeds this limit will not be drawn or included in contouring. This allows you to avoid abnormally long triangulation lines where you have relatively too few data points and on the outskirts of your data points. The **Exterior** value applies to triangulation lines around the perimeter of the triangulation area and the **Interior** value applies all the other triangulation lines. Generally you would have the exterior value larger than the interior.

Error Log

The following dialog box appears when the Triangulate & Contour routine finds a conflict between breaklines or other surface entities. The type of conflict is identified, and when an item is chosen, a highlighted arrow is temporarily placed in the drawing to indicate the exact location of the specific conflict. Crossing Breaklines indicates that the intersection of two entities has two differing elevations. Vertical Edges indicates that two entities or vertexes of differing elevations have the same xy location, thus forming a vertical plane.

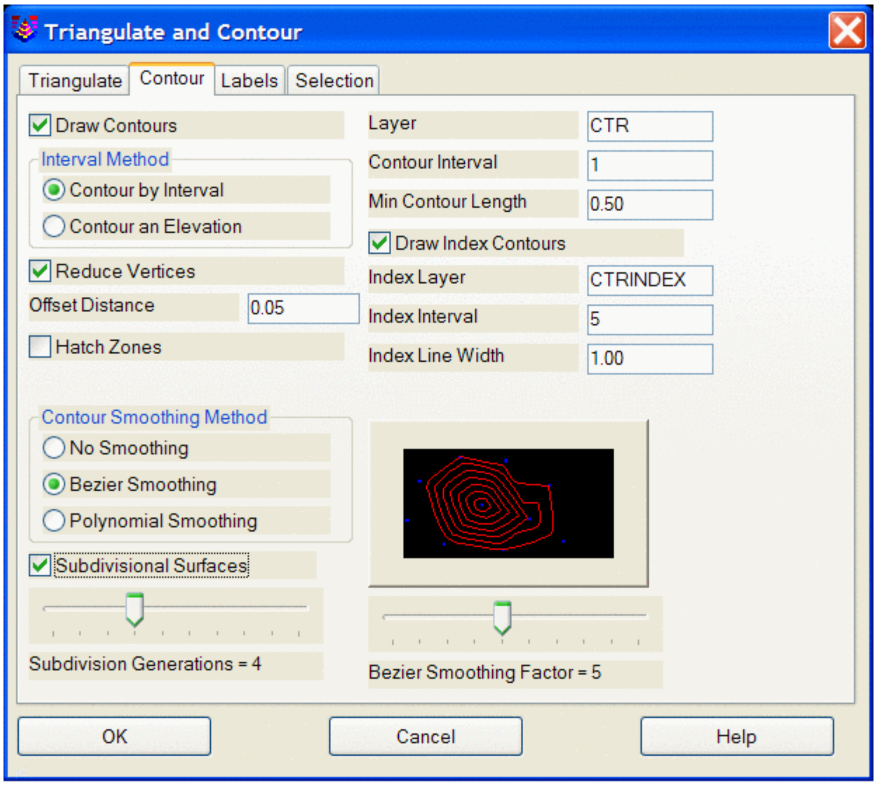


Error Log: C:\Scad2005\User\Trierror.xml

- Crossing Breaklines
  - Crossing Breakline #1
  - Crossing Breakline #2
  - Crossing Breakline #3
  - Crossing Breakline #4
  - Crossing Breakline #5
  - Crossing Breakline #6
  - Crossing Breakline #7
- Vertical Edges
  - Vertical Edge #1

Layer name: BAD_TIN
Symbol size: 10.0
☑ Draw Lines

Contour Tab



Triangulate and Contour

☑ Draw Contours
Interval Method
● Contour by Interval
○ Contour an Elevation
☑ Reduce Vertices
Offset Distance: 0.05
☐ Hatch Zones
Contour Smoothing Method
○ No Smoothing
● Bezier Smoothing
○ Polynomial Smoothing
☑ Subdivisional Surfaces
Subdivision Generations = 4

Layer: CTR
Contour Interval: 1
Min Contour Length: 0.50
☑ Draw Index Contours
Index Layer: CTRINDEX
Index Interval: 5
Index Line Width: 1.00
Bezier Smoothing Factor = 5

Draw Contours

When this box is checked, the program will draw contour lines after triangulating. Otherwise, only the designated triangulation operations are performed. Specify the layer for contours in the edit box to the right.

Contour by Interval or **Contour an Elevation**
Select whether to contour by interval (ie: every 10 feet) or to contour a certain elevation. The elevation option allows

you to contour specific values. For example, if you want just the 100ft contour, then select elevation and enter 100. The default mode is by interval.

Contour Interval

Specify the interval to contour. Note: If the above option is set to Contour an Elevation, then this field is used to specify the elevation to contour.

Minimum Contour Length

Contour lines whose total length is less than this value will not be drawn.

Reduce Vertices

This option attempts to remove extra vertices from the contour polylines which has the advantages of a faster drawing and smaller drawing size. Default is ON

Offset Distance

When the Reduce Vertices option is enabled, This value is the maximum tolerance for shifting the original contour line in order to reduce vertices. The reduced contour polyline will shift no more than this value, at any point, away from the original contour line. A lower value will decrease the number of vertices removed and keep the contour line closer to the original. A higher value will remove more vertices and allows the contour line to shift more from the original.

Hatch Zones

When activated, this option will allow you to hatch the area between the contours sequentially. A secondary dialog will load allowing the user to specify the hatch type and color.

Draw Index Contours

This option creates highlighted contours at a specified interval. When enabled, the fields for Index Layer, Index Interval and Index Line Width are activated.

Contour Smoothing Method

Select the type of contour smoothing to be performed. Bezier smoothing holds all the contour points calculated from the triangulation and only smooths between the calculated points. Polynomial smoothing applies a fifth degree polynomial for smooth transition between the triangulation faces. The smoothing factor described below affects the smoothing bulge.

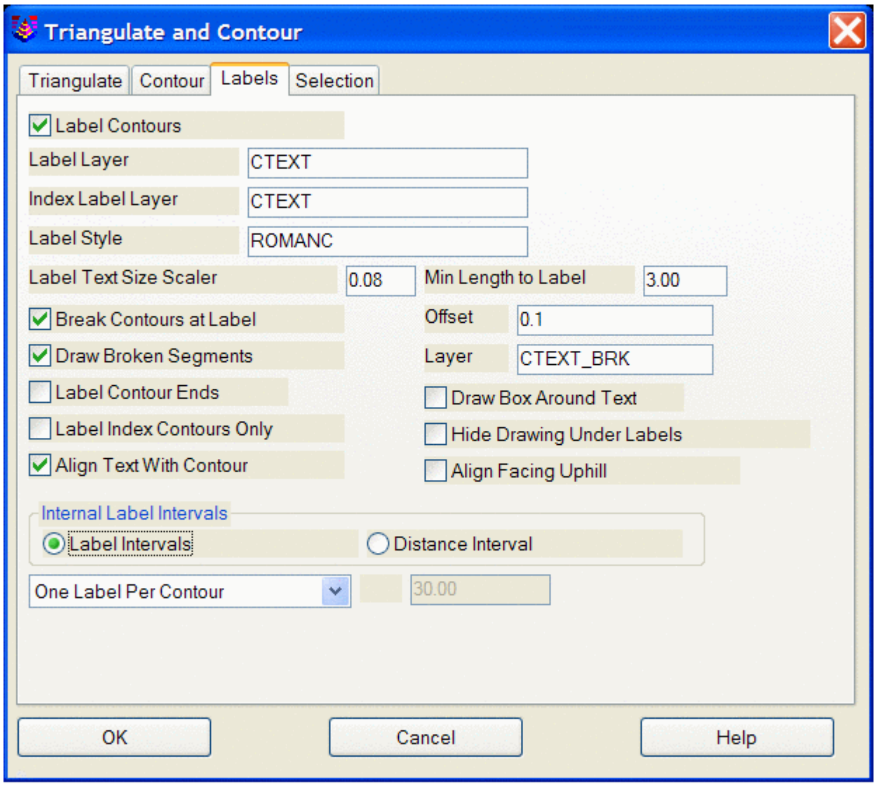
Bezier Smoothing Factor

The contour preview window shows you an example of how much smoothing can be expected at each setting. Sliding the bar to the left results in a lower setting which have less looping or less freedom to curve between contour line points. Likewise, moving the slider to the right results in a setting that increases the looping effect.

Subdivisional Surfaces / Subdivisions Generation

This option causes each triangle in the triangulation surface model to be subdivided into an average of three smaller triangles per subdivision generation, with the new temporary vertices raised or lowered to provide smoother contours. More generations increases the smoothness of the algorithm at a cost of increased processing time. If Straight Lines are chosen as the contouring drawing method, then the contours are guaranteed never to cross. The original points of the surface model are always preserved. These modifications to the surface model are only for contouring purposes and are not written to the triangulation (.FLT) file or inserted into the drawing. If some contour movement is too small for appearance's sake, consider enabling Reduce Vertices.

Labels Tab



☑ Label Contours
Label Layer: CTEXT
Index Label Layer: CTEXT
Label Style: ROMANC
Label Text Size Scaler: 0.08
Min Length to Label: 3.00
☑ Break Contours at Label
Offset: 0.1
☑ Draw Broken Segments
Layer: CTEXT_BRK
☐ Label Contour Ends
☐ Draw Box Around Text
☐ Label Index Contours Only
☐ Hide Drawing Under Labels
☑ Align Text With Contour
☐ Align Facing Uphill
Internal Label Intervals
● Label Intervals ○ Distance Interval
One Label Per Contour
30.00

Label Contours

When activated, contours will be labeled based on the settings below.

Label Layer

Specifies layer name for intermediate contour labels.

Index Label Layer

Specifies layer name for index contour labels.

Label Style

Specifies the text style that will be used for the contour label text.

Label Text Size Scaler

Specifies the size of the contour labels based on a multiplier of the horizontal scale.

Min Length to Label

Contours whose length is less than this value will not be labeled.

Break Contours at Label

When checked, contour lines will be broken and trimmed at the label location for label visibility. When enabled, the Offset box to the right activates. The Offset determines the gap between the end of the trimmed contour line and the beginning or ending of the text.

Draw Broken Segments

When checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.

Label Contour Ends

When checked, contour ends will be labeled.

Draw Box Around Text

When checked, a rectangle will be drawn around contour elevation labels.

Label Index Contours Only

When checked, only the index contours will be labeled. This option is active only when "Draw Index Contours" has been selected in the Contour tab of the main dialog.

Hide Drawing Under Labels

This option activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour is fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, and the contour lines themselves remain contiguous. This feature will also hide other entities that area in the immediate vicinity of the contour label.

Align Text with Contour

When checked, contour elevation labels will be rotated to align with their respective contour lines. This option also activates the Align Facing Uphill feature explained below.

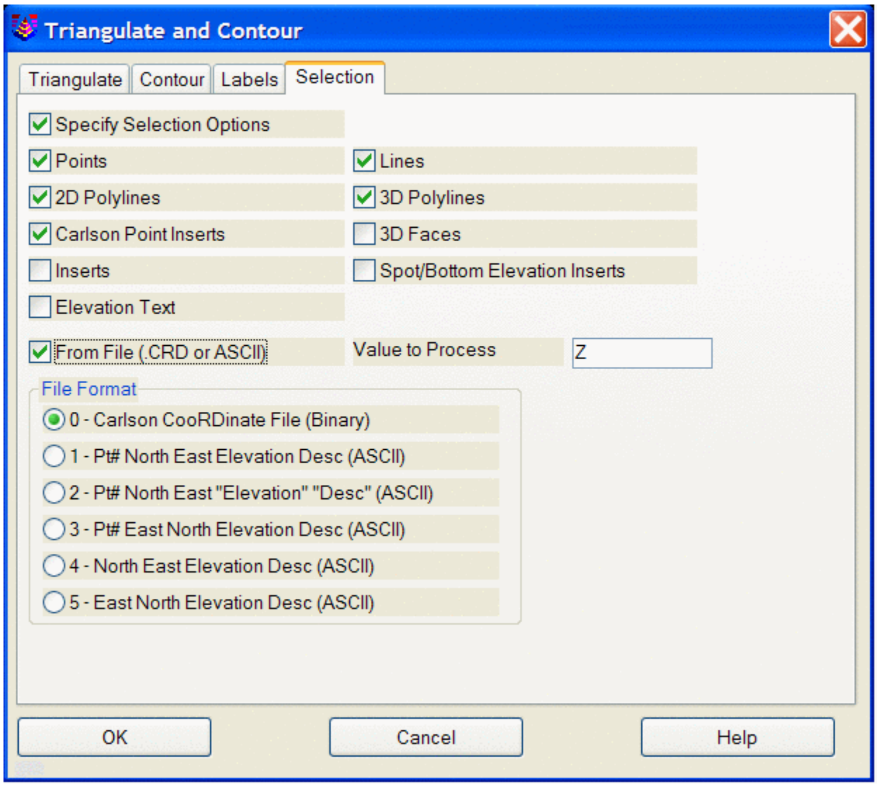
Align Facing Uphill

When checked, contour elevation labels will still be rotated to align with their respective contour lines, but the labels will be flipped in such a manner that the bottom of the text label will always be toward the downhill side of the contours. So as the labels are read right side up, you are always facing uphill.

Internal Label Intervals

Choose between label intervals or distance interval. Label intervals will label each contour with a set number of labels. Distance interval lets you specify a distance between labels.

Selection Tab



Triangulate and Contour

Triangulate | Contour | Labels | Selection

☑ Specify Selection Options

☑ Points ☑ Lines

☑ 2D Polylines ☑ 3D Polylines

☑ Carlson Point Inserts ☐ 3D Faces

☐ Inserts ☐ Spot/Bottom Elevation Inserts

☐ Elevation Text

☑ From File (.CRD or ASCII) Value to Process: Z

File Format

● 0 - Carlson CooRDinate File (Binary)

○ 1 - Pt# North East Elevation Desc (ASCII)

○ 2 - Pt# North East "Elevation" "Desc" (ASCII)

○ 3 - Pt# East North Elevation Desc (ASCII)

○ 4 - North East Elevation Desc (ASCII)

○ 5 - East North Elevation Desc (ASCII)

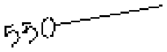
Specify Selection Options

When checked, this allows you to control what type of entities *Triangulate & Contour* uses.

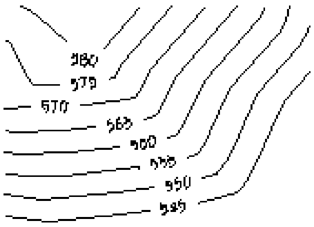
Points, 3D Polylines, 2D Polylines, Lines, Inserts are standard AutoCAD entities types.

Spot/Bottom Elevation Inserts include text entities that start with 'X'.

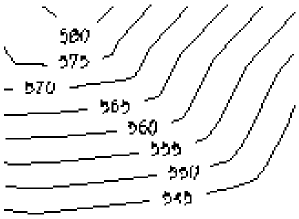
From File allows you to triangulate from the points in a coordinate (.CRD) or ASCII file.



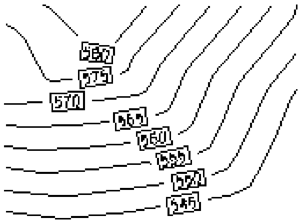
Label Contour Ends



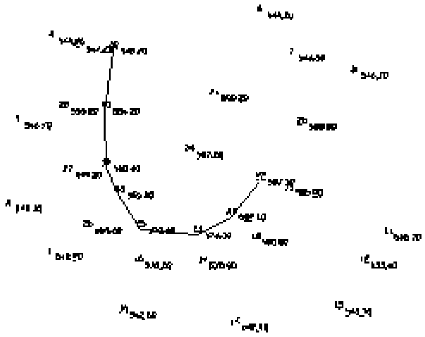
Align Text With Contour ON

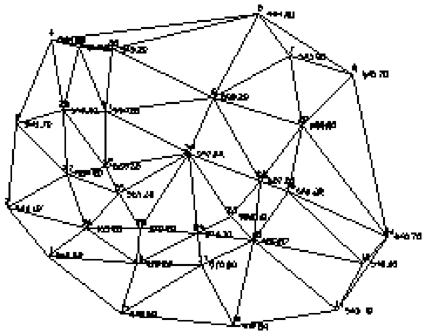


Align Text With Contour OFF

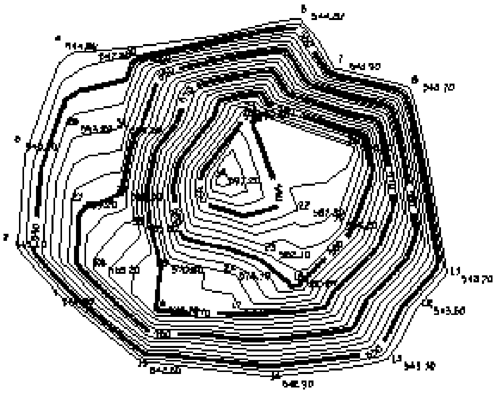


Draw Box Around Text





Triangulation network without contouring
Original data points with one 3D polyline



Contours without triangulation network. The contours are smoothed, reduced, drawn at an interval of 2, and highlighted at an interval of 10 with labeling on the index contours.

Pull-Down Menu Location: Tools-> Surface Tools
Prerequisite: Data points of the surface
Keyboard Command: tri

Triangulation File Utilities

This command allows you to modify TIN surfaces in a variety of different ways, then allows for 3d viewing and shading of the modified surface and finally for saving the file with a choice of output formats. The focus of the routine is to elevate or lower the TIN or selected areas within the TIN, merge TINs with other surfaces, or use data from other TIN files to apply to the current TIN. Operations can be performed on the entire TIN or just on user selected Inclusion and/or Exclusion areas. The routine will automatically rework the TIN network for conformation to a selected boundary, say a building outline. In the case of said building, a value of 10 could be subtracted from the building outline. This will drop all of the triangulation within the outline by 10', thus creating a model of the excavated area for the building. The modified TIN can then be saved to a new file, which could be used to compute an excavation volume with Volumes by Triangulation. This routine does not allow for manual reconfiguration of the TIN network. This is performed under Surface Tools, also in the Contour pulldown menu. This routine also includes conversions to and from TIN files, DXF files and 3D Face entities.

Begin with the dialog shown here. First select a TIN model. You may choose between an .flt or .tin file, a DXF file (that includes 3DFACE entities), or 3DFACE entities in the current drawing. Specify the subject area by choosing inclusion or exclusion perimeters, then press the next button.

Load TIN File: Allows you to specify a triangulation (.flt or .tin) file to load.

Load DXF File: Allows you to specify a DXF file to load. Only loads 3DFACE entities from the selected DXF file.

Select 3D Faces: Allows you to select 3DFACE entities from the current drawing. This also includes rectangular 3d faces from a plotted grid.

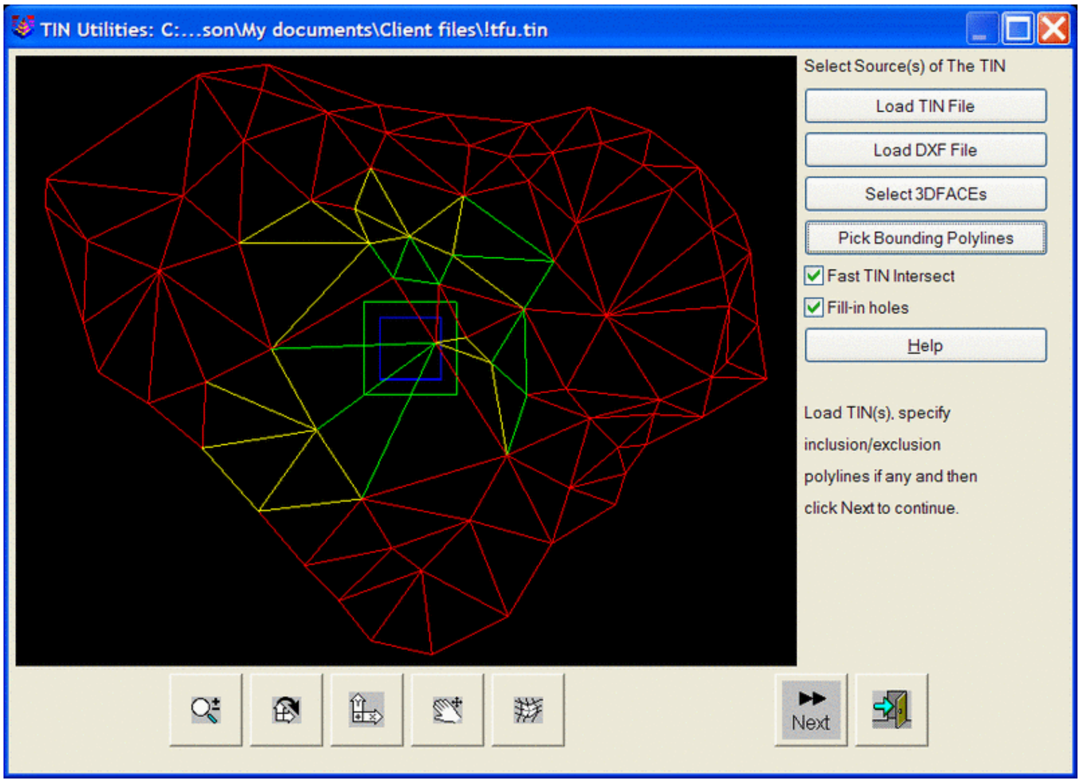
Pick Bounding Polylines: Allows you to select any inclusion/exclusion perimeter(s). When this button is selected, the user is taken back to the drawing and prompted to select the perimeters. Press Enter when the selections are finished to return back to the dialog.

Fast TIN Intersect: When checked, this command will not try and intersect 3DFACE entities.

Fill-in-holes: When checked, any missing triangulation or gap in the surface will be automatically filled in with additional triangles. This option has to set before loading the TIN file to take effect.

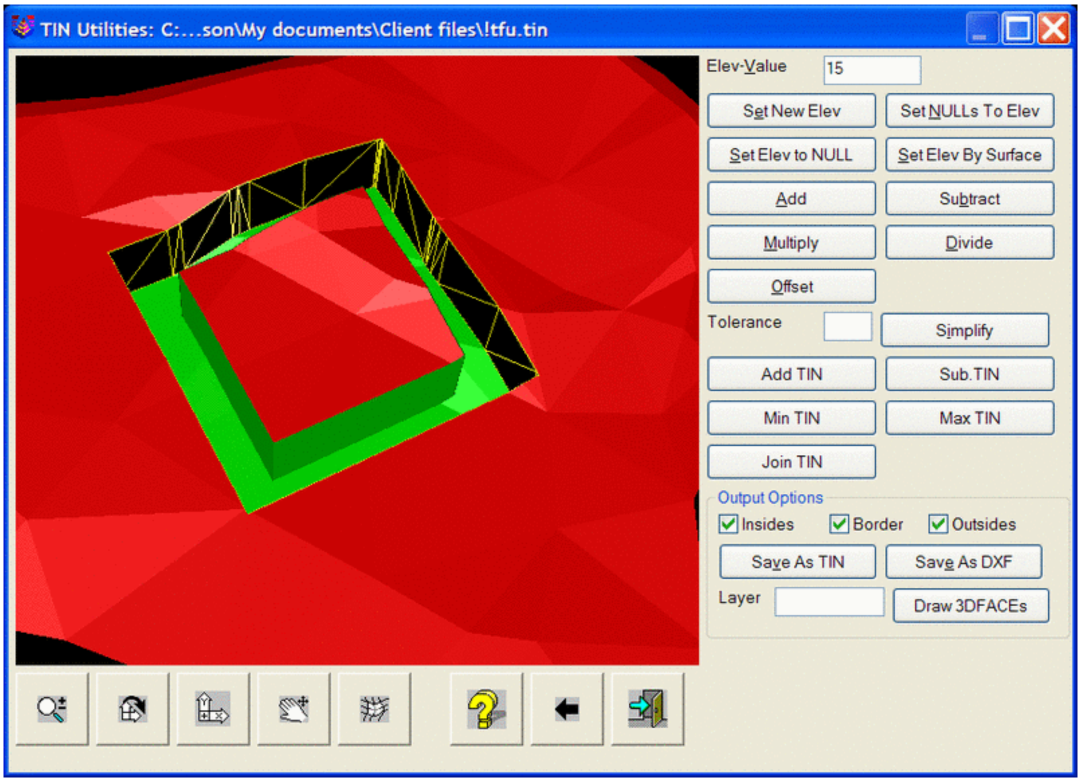
Next: Press this button to proceed to the next dialog after all selections have been made .

The next dialog allows you to perform mathematical operation(s) on the loaded TIN. Each operation is described below. Keep in mind that generally these operations are to be performed on an area inside your inclusion perimeter (but excluding anything inside your exclusion perimeters). If you


TIN Utilities: C:...son\My documents\Client files\!tfu.tin
Select Source(s) of The TIN
Load TIN File
Load DXF File
Select 3DFACEs
Pick Bounding Polylines
Help
Next

☑ Fast TIN Intersect
☑ Fill-in holes

Load TIN(s), specify inclusion/exclusion polylines if any and then click Next to continue.


TIN Utilities: C:...son\My documents\Client files\!tfu.tin
Set New Elev
Set NULLs To Elev
Set Elev to NULL
Set Elev By Surface
Add
Subtract
Multiply
Divide
Offset
Tolerance
Simplify
Add TIN
Sub.TIN
Min TIN
Max TIN
Join TIN
Output Options
Save As TIN
Save As DXF
Layer
Draw 3DFACEs

Elev-Value 15

☑ Insides ☑ Border ☑ Outsides

do not specify any perimeters, the desired operation/s will be performed on the entire TIN.

Elev-Value: Specify either an elevation or value depending on the operation. The value specified will be used for subsequent operations.

Set New Elevation: Sets all TIN faces in the subject area to the elevation specified in the Elev-Value field.

Set NULL's to Elevation: Sets all NULL values in the subject area to the elevation specified in the Elev-Value field.

Set Elevation's to NULL: Sets all of the elevation values in the subject area to NULL.

Set Elevation by Surface: Sets all TIN faces within the subject area to the elevations from a second surface file within the same area. You will be prompted to select a second TIN file or grid file. Only areas common to both surfaces will be applied to the subject TIN.

Add: Adds the value specified in the Elev-Value field to the subject area of the TIN.

Subtract: Subtracts the value specified in the Elev-Value field to the subject area of the TIN.

Multiply: Multiplies by the value specified in the Elev-Value field to the subject area of the TIN.

Divide: Divides by the value specified in the Elev-Value field to the subject area of the TIN.

Offset: Performs a perpendicular offset of the TIN surface by the specified amount.

Tolerance: This setting is used by the Simplify command described below. Specify the maximum average distance that any point can be moved outside of the plane of any triangle that connects to that point. Values might range from .01 to .1 for most purposes.

Simplify: Causes edges within the Tin mesh to be collapsed to reduce the number of triangles, edges, and points within the mesh while having a minimal impact on the overall shape of the mesh.

Add TIN: Raises the subject area of the current TIN by the elevation value from a second user selected TIN file. This function is most applicable to applying a strata thickness TIN.

Subtract TIN: Lowers the subject area of the current TIN by the elevation value from a second user selected TIN file.

Min TIN: This does a comparison between the current TIN and a second user selected TIN file, and applies the lower value of the two TINs to the subject area.

Max TIN: This does a comparison between the current TIN and a second user selected TIN file, and applies the higher value of the two TINs to the subject area.

Join TIN: Merges the existing subject TIN into a second user selected TIN file. The subject TIN file should be the smaller of the two surfaces since the subject file will be joined or merged into the second file.

Insides: If this is the only option checked, only changes made within the inclusion perimeter will be saved. TIN entities outside of the perimeter will not be saved.

Border:

Outsides: If this is the only option checked, TIN entities inside of the inclusion perimeter will not be saved. Everything outside of the perimeter will be saved.

SaveAs TIN: Saves the current TIN as an .flt or .tin file.

SaveAs DXF: Saves the current TIN as a DXF file. This format can be used by many other CAD programs.

Draw As 3DFaces: Draws the current TIN as 3D Faces in the current viewport. The Layer window is used to specify the layer that the faces will be created in.

This icon converts the right mouse button to a zoom function. Hold the button down and move the mouse up or down to zoom in and out. This icon converts the right mouse button to a rotate function. Hold the button down to rotate the view in any X, Y or Z direction. When the XY appears in the window, the rotation will occur relative to the XY axis. When the mouse is moved toward the outer perimeter of the window, the XY will change to a Z. Holding the button down while the Z is visible will rotate the drawing on the Z axis. This icon converts the right mouse button to a pan function. Hold down on the button while moving the mouse to pan. Holding down the mouse wheel will also serve as a pan function in any of the above modes. This icon toggles shading on and off. This icon restores the graphics to plan view. This icon reverses the effects of all operations performed on the TIN and reverts it back to its original status. This icon exits the routine. If the TIN has been modified, you will be prompted to save.

Pull-Down Menu Location: Tools-> Surface Tools
Prerequisite: 3D Faces, a TIN file or a DXF file.
Keyboard Command: TINUTIL

Volumes By Triangulation

Volumes By Triangulation is an alternative volume method that compares two triangulation networks. This method is different from the grid based volume routines (*Stockpile Volumes, etc.*) and the cross section volume routine (*Calculate Section Volume*). Volumes by Triangulation calculates faster in most cases than the other methods, and it is the most accurate because it uses true TIN to TIN prismodal volumes. This added accuracy in general is very small. The grid resolution is usually sufficient to model the surface for the grid based volumes. The Volume By Triangulation accuracy applies well when there is a feature like a 5 foot wide ditch. Then the grid resolution would need to be less than 5 foot to model the ditch which might be difficult on a large site.

The disadvantage to this routine is that it lacks the output options that help the analysis of the volume such as Difference Contours. Also Volumes by Triangulation does no extrapolation and stops calculating volume at the perimeter of the smaller of the two triangulation networks. Volumes By Triangulation is better when used with point data instead of contour data because contour data requires triangulating all the contour polylines as breaklines which creates a large triangulation network and is slower.

The triangulation networks to compare are defined in .flt files that are created by *Triangulate & Contour* with the Write Triangulation File option. Before using this command, run *Triangulate & Contour* twice to create an triangulation (.TIN) file for each surface. The volume calculation is limited by either the extent of the triangulation networks or by an inclusion/exclusion perimeter(s). These perimeters must be closed polylines.

Output data includes area, tons by density, average thickness, shrink and swell, ratio, and total volume.

Prompts

Select EXISTING surface Tmesh File Choose a .tin file
Select FINAL surface Tmesh File Choose another .tin file
Pick inclusion perimeter polyline (ENTER for none): *pick a closed polyline perimeter*
Calculating ...
Write report to file (Yes/<No>)? *Press Enter*
Write report to printer (Yes/<No>)? *Press Enter*
Comparing Triangulation files: C:\SCADXML\DATA\TRI1.FLT
and C:\SCADXML\DATA\TRI2.FLT

Cut volume: 66891.35 C.F., 2477.46 C.Y.
Fill volume: 43458.01 C.F., 1609.56 C.Y.

Pull-Down Menu Location: Tools-> Surface Tools
Prerequisite: Two .tin files.
Keyboard Command: trivol

Calculate Stockpile Volume

This command is a customized and simplified method for calculating volumes in a situation in which the entire volume to be calculated is above the perimeter elevation, such as in the case of a stockpile of material. The complimentary command, *Calculate Pond/Pit Volume,* is for the opposite situation, in which the entire volume to be calculated is below the elevation of the perimeter.

The program internally computes base and final grid surfaces from drawing geometry. The base surface is calculated from a 3D polyline representing the perimeter of the area being analyzed. If that 3D polyline is drawn on the PERIMETER layer, the command will automatically detect and use it. If no 3D polyline is found on that layer, you have an opportunity to manually select another 3D polyline to use. The 3D polyline perimeter can be drawn with the Draw 3D Polyline Perimeter command before using this routine.

The 3D polyline perimeter is also used as the inclusion perimeter for the volume calculation.

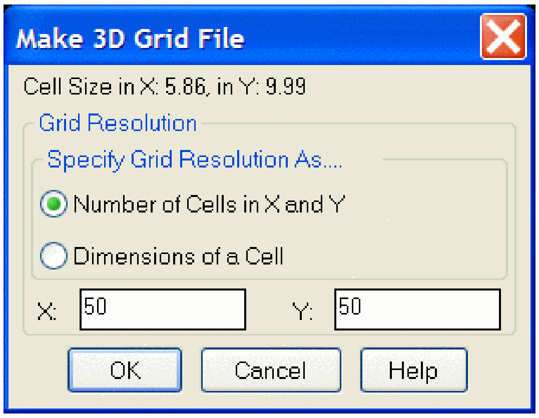
Additional 3D polylines can also be specified to more precisely define the base surface. These must be on the BASE_BREAKLINE layer to be used for this purpose. These can be generated by the *Draw 3DPoly Base Breakline* routine.

The final surface is calculated from all of the other selected drawing entities such as points, line, inserts, and polylines, along with the perimeter polyline, but not including the BASE_BREAKLINE polylines.

You have the option of setting the resolution of the grids.

Prompts

Material density lbs/ft^3 (Enter for none): *enter a material density in lbs per cubic foot, or press Enter for none*
Ignore Zero Elevations [<Yes>/No]?
Select stockpile entities and perimeter.
Select objects: *pick the objects that define the stockpile and the 3D polyline perimeter*
Select stockpile perimeter polyline:


Make 3D Grid File

Cell Size in X: 5.86, in Y: 9.99

Grid Resolution

Specify Grid Resolution As....

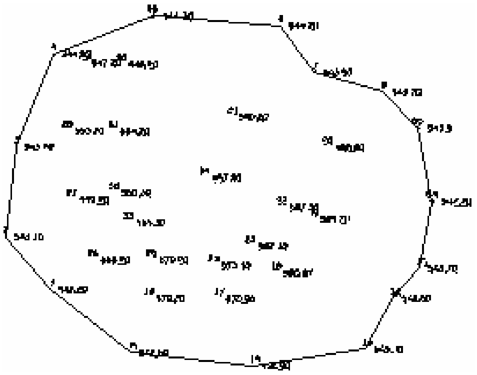
● Number of Cells in X and Y

○ Dimensions of a Cell

X: 50 Y: 50

Make Grid File dialog Set the resolution and then click OK.

```
Volume report
Lower left grid corner: 15965.45,12657.05
Upper right grid corner: 16269.40,12906.29
X grid resolution: 50, Y grid resolution: 50
X grid cell size: 6.08, Y grid cell size: 4.98
Stockpile volume: 1191674.87825 cubic ft, 44136.107 cubic yards
```



Stockpile defined by points and a 3D polyline perimeter
Window these objects to obtain the volume report

Keyboard Command: stockvol
Prerequisite: Data representing the stockpile surface and a 3D polyline representing the perimeter of the stockpile.

Calculate Pond/Pit Volume

This command is a customized and simplified method for calculating volumes in a situation in which the entire volume to be calculated is below the perimeter elevation, such as in the case of a pond or pit. The complimentary command, *Calculate Stockpile Volume,* is for the opposite situation, in which the entire volume to be calculated is above the elevation of the perimeter.

The program internally computes base and final grid surfaces from drawing geometry. The base surface is calculated from a 3D polyline representing the perimeter of the area being analyzed. If that 3D polyline is drawn on the PERIMETER layer, the command will automatically detect and use it. If no 3D polyline is found on that layer, you have an opportunity to manually select another 3D polyline to use. The 3D polyline perimeter can be drawn with the Draw 3D Polyline Perimeter command before using this routine.

The 3D polyline perimeter is also used as the inclusion perimeter for the volume calculation.

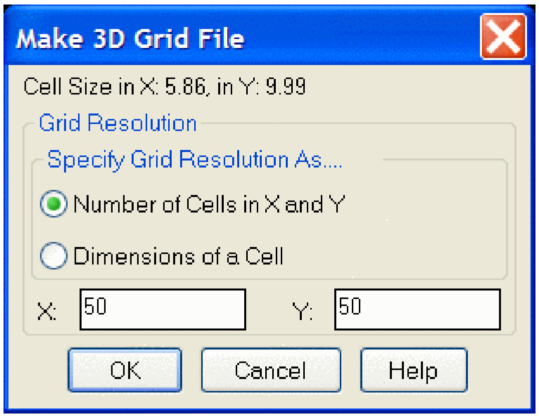
Additional 3D polylines can also be specified to more precisely define the base surface. These must be on the BASE_BREAKLINE layer to be used for this purpose. These can be generated by the *Draw 3DPoly Base Breakline* routine.

The final surface is calculated from all of the other selected drawing entities such as points, line, inserts, and polylines, along with the perimeter polyline, but not including the BASE_BREAKLINE polylines.

You have the option of setting the resolution of the grids.

Prompts

Ignore Zero Elevations [<Yes>/No]?
Select Pond/Pit entities and perimeter.
Select objects: *pick the objects that define the surface and the 3D polyline perimeter*
Select Pond/Pit perimeter polyline:


Make 3D Grid File
Cell Size in X: 5.86, in Y: 9.99
Grid Resolution
Specify Grid Resolution As....
● Number of Cells in X and Y
○ Dimensions of a Cell
X: 50
Y: 50
OK
Cancel
Help

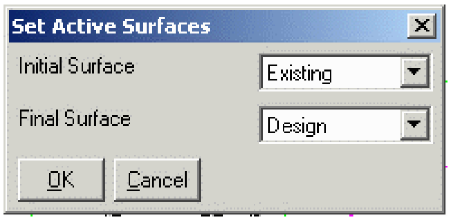
Make Grid File dialog Set the resolution and then click OK.

Keyboard Command: pitvol
Prerequisite: Data representing the pond/pit surface and a 3D polyline representing the perimeter of the pond/pit.

Set Active Surfaces

This command assigns which surfaces to use for initial and final. These surfaces are used by all the Takeoff routine that compare surfaces including:
- Calculate Total Volumes
- Calculate Volumes Inside Perimeter
- 3D Drive Simulation
- Cut/Fill Contours/Labels/Color Map
- Surface Inspector
- Quick Profile
- etc.

The surface created by the Make Existing Ground Surface command is called "Existing" and is the default for the Initial Surface. The surface created by the Make Design Surface command is called "Design" and is the default for the Final Surface.


Set Active Surfaces
Initial Surface
Existing
Final Surface
Design
OK
Cancel

The purpose of this routine to for selecting user-defined surfaces to use in place of the existing ground or the design surface. For example, there could be a user-defined surface for alluvial soil that is set as the initial surface while design is set to the final surface. Then the calculate volume routines will report the quantities between alluvial soil and design. Also the Display->Cut/Fill Color Map routine will make the map for the difference between the alluvial soil and design surfaces.

These user-defined surfaces can be created using the Add Target function in the Define Layer Target/Material/Subgrade command combined with the Make User-Defined Surface command.

Prerequisite: a surface model
Keyboard Command: set_active_tins

Design Surface Vertical Offset

This command can be used to lower or raise the design surface within a defined perimeter or by the entire surface.

Prerequisite: a design surface
Keyboard Command: adjust_final

Existing Surface Vertical Offset

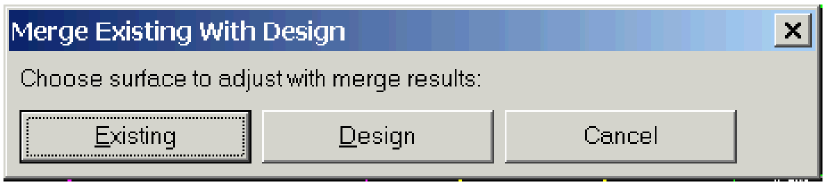
This command can be used to lower or raise the existing surface within a defined perimeter or by the entire surface.

Prerequisite: an existing surface
Keyboard Command: adjust_exist

Merge Existing With Design

This command allows you to merge the existing surface with design surface within perimeter polylines. The resulting merged surface can be saved to update either the Existing or Design surfaces. The program prompts for inclusion and exclusion perimeter polylines. These polylines must be closed. The merge will be applied inside the inclusion perimeters and not inside the exclusion perimeters. The exclusion perimeters are optional.

For example, if a portion of the site is completed, you can update the existing surface to match the design for the completed area. First, draw a closed polyline around the completed area. Then run Merge Existing With Design and choose the merge results target as Existing. Then select the perimeter polyline.


Choose surface to adjust with merge results:

Pulldown Menu Location: Takeoff > Surface Tools
Prerequisite: existing and design surfaces and an inclusion perimeter polyline
Keyboard Command: merge_final

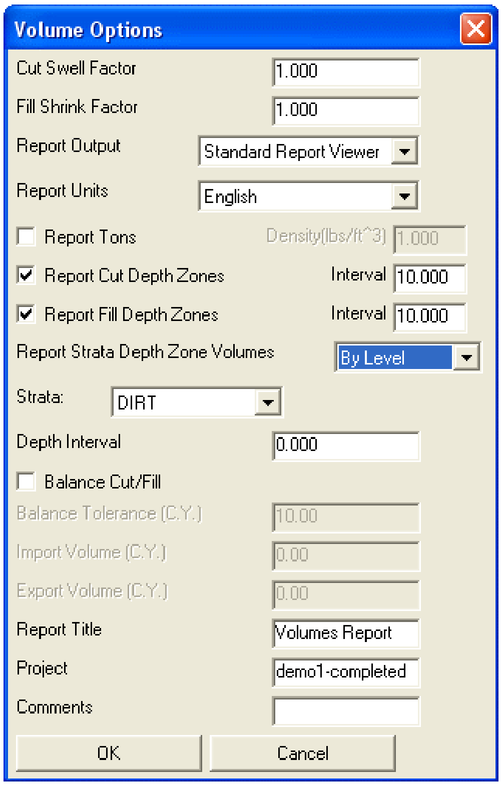
Calculate Total Volumes

Use this command to report total volume calculations within the site boundary polyline. The report includes the cut and fill quantities, slope and horizontal area, average and max strata cut depth and max cut/fill depths and locations. Also in the report, strata and topsoil quantities if the site has strata and topsoil defined. Besides reporting the total quantities for the site boundary, Area Of Interest polylines can be used to report quantities within named perimeters.

Before running this command, the existing and design surfaces must be created and the boundary polyline must be assigned. Also, the strata surfaces, topsoil and Area Of Interest polylines need to be set before this command if those features are to be reported.

The Volume Options dialog box shown here offers options for the final report. Here you can select four different types of reports: Standard Report Viewer, Custom Report Formatter, Expanded Auto Format, and Compressed Auto Format. The Cut Swell Factor is multiplied by the cut volume and the Fill Shrink Factor is multiplied by the fill volume. Report Cut/Fill Depth Zones breaks the Cut/Fill volumes up by user-defined depth intervals. The Report Units setting chooses between English and Metric quantities for the report. In Drawing Setup in Takeoff, you set the drawing units as either English or Metric. The Report Units will default to match the drawing units but you can change the Report Units to the other mode and the program will apply the conversion between English and Metric for the report. So you can have a drawing in English units and create a report with Metric quantities.

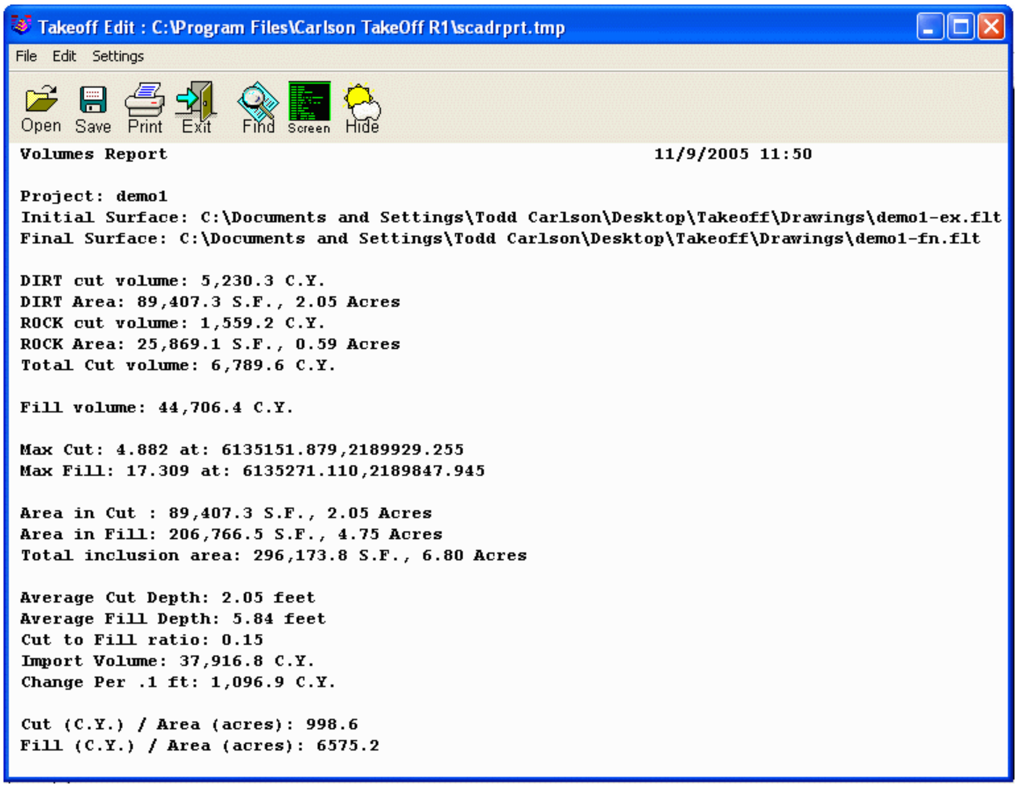
Note: As the quantities are calculated within each area, the area is hatched with a solid fill as a visual verification that the right area is being processed.



Volume Options

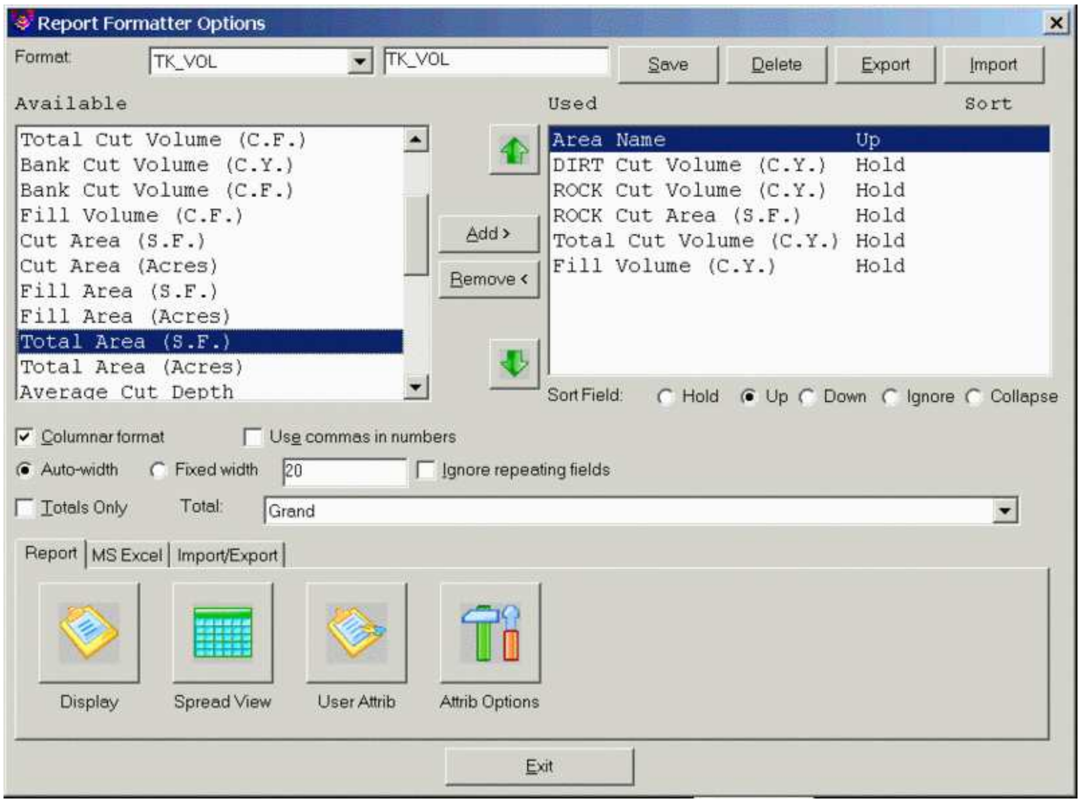
Cut Swell Factor 1.000
Fill Shrink Factor 1.000
Report Output Standard Report Viewer
Report Units English
☐ Report Tons Density(lbs/ft^3) 1.000
☑ Report Cut Depth Zones Interval 10.000
☑ Report Fill Depth Zones Interval 10.000
Report Strata Depth Zone Volumes By Level
Strata: DIRT
Depth Interval 0.000
☐ Balance Cut/Fill
Balance Tolerance (C.Y.) 10.00
Import Volume (C.Y.) 0.00
Export Volume (C.Y.) 0.00
Report Title Volumes Report
Project demo1-completed
Comments

Shown here is an example of a Standard Report Viewer.


Takeoff Edit : C:\Program Files\Carlson TakeOff R1\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Volumes Report                                              11/9/2005 11:50

Project: demo1
Initial Surface: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo1-ex.flt
Final Surface: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo1-fn.flt

DIRT cut volume: 5,230.3 C.Y.
DIRT Area: 89,407.3 S.F., 2.05 Acres
ROCK cut volume: 1,559.2 C.Y.
ROCK Area: 25,869.1 S.F., 0.59 Acres
Total Cut volume: 6,789.6 C.Y.

Fill volume: 44,706.4 C.Y.

Max Cut: 4.882 at: 6135151.879,2189929.255
Max Fill: 17.309 at: 6135271.110,2189847.945

Area in Cut : 89,407.3 S.F., 2.05 Acres
Area in Fill: 206,766.5 S.F., 4.75 Acres
Total inclusion area: 296,173.8 S.F., 6.80 Acres

Average Cut Depth: 2.05 feet
Average Fill Depth: 5.84 feet
Cut to Fill ratio: 0.15
Import Volume: 37,916.8 C.Y.
Change Per .1 ft: 1,096.9 C.Y.

Cut (C.Y.) / Area (acres): 998.6
Fill (C.Y.) / Area (acres): 6575.2
```

Use Customs Report Formatter to customize or "user define" the reporting options. The Report Formatter Options dialog box shown here offers a variety of output options including Excel. You can choose the fields to report from the Available list and set their report order under the Used list.


Report Formatter Options
Save
Delete
Export
Import
Add >
Remove <
Report
MS Excel
Import/Export
Display
Spread View
User Attrib
Attrib Options
Exit

Format: TK_VOL TK_VOL

Available

- Total Cut Volume (C.F.)
- Bank Cut Volume (C.Y.)
- Bank Cut Volume (C.F.)
- Fill Volume (C.F.)
- Cut Area (S.F.)
- Cut Area (Acres)
- Fill Area (S.F.)
- Fill Area (Acres)
- Total Area (S.F.)
- Total Area (Acres)
- Average Cut Depth

Used	Sort
Area Name	Up
DIRT Cut Volume (C.Y.)	Hold
ROCK Cut Volume (C.Y.)	Hold
ROCK Cut Area (S.F.)	Hold
Total Cut Volume (C.Y.)	Hold
Fill Volume (C.Y.)	Hold

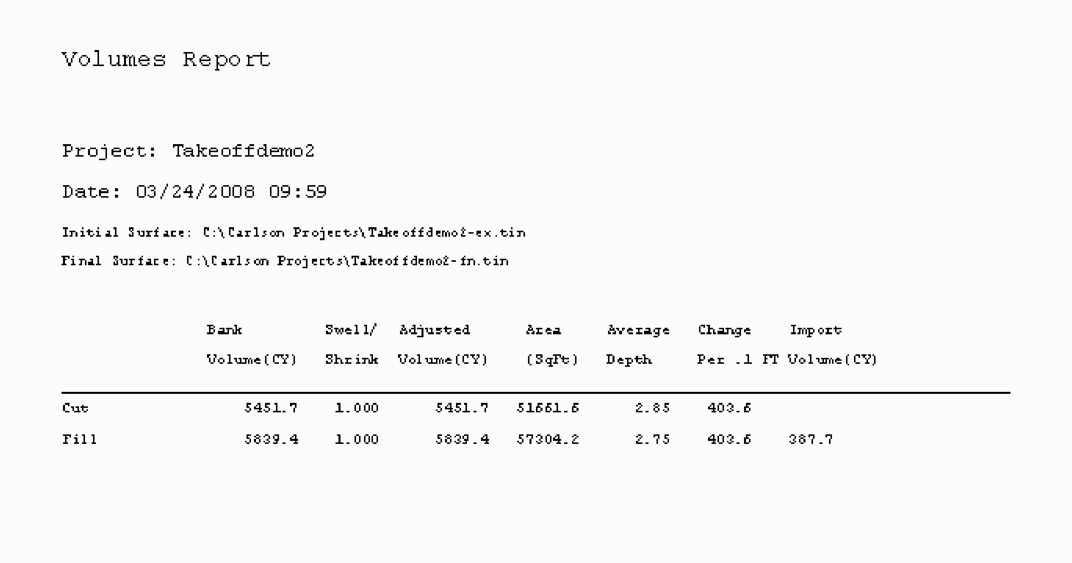
Sort Field: ○ Hold ● Up ○ Down ○ Ignore ○ Collapse

☑ Columnar format ☐ Use commas in numbers

● Auto-width ○ Fixed width 20 ☐ Ignore repeating fields

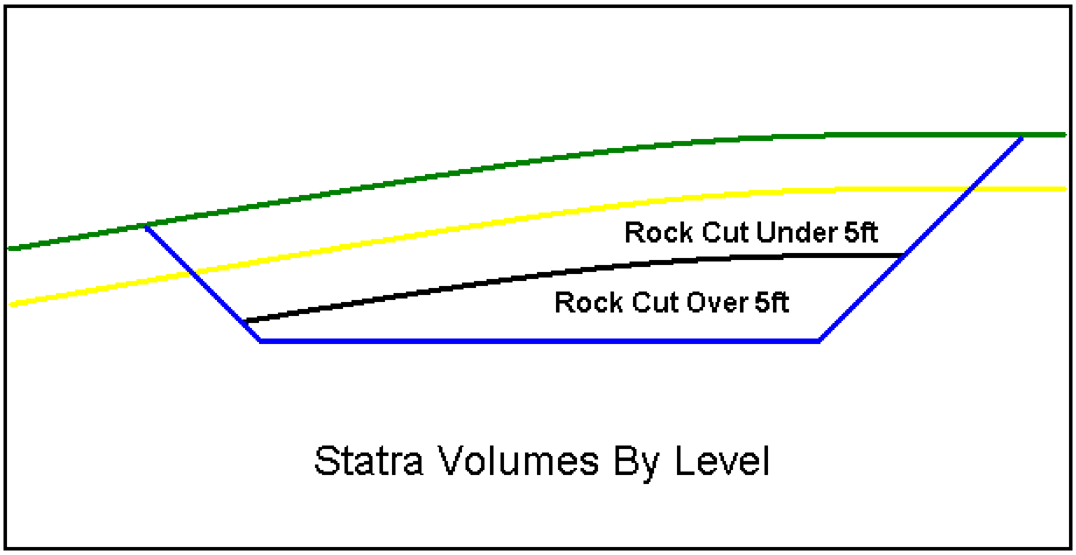
☐ Totals Only Total: Grand

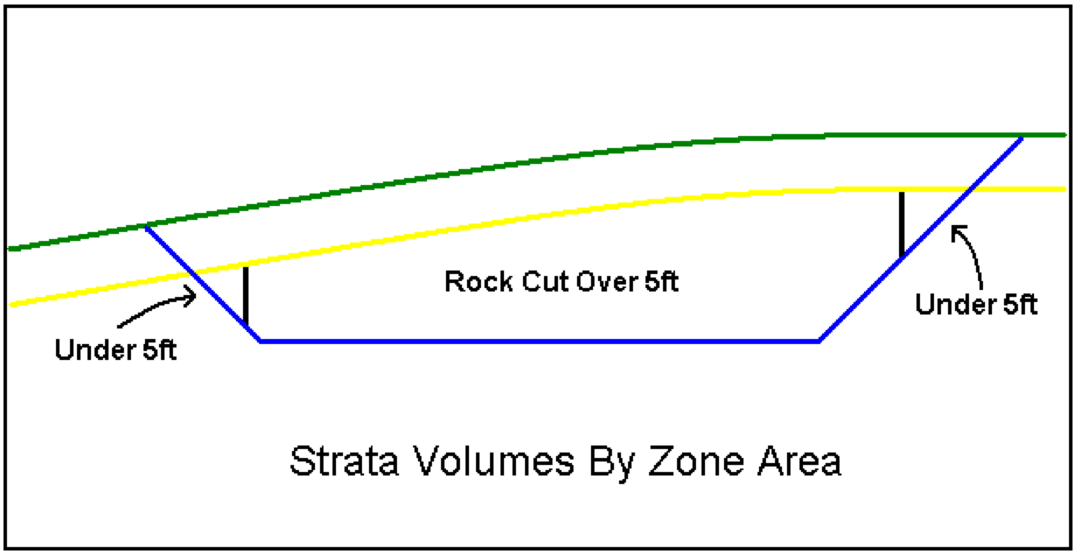
The Expanded Auto Format is shown in this DWF preview.



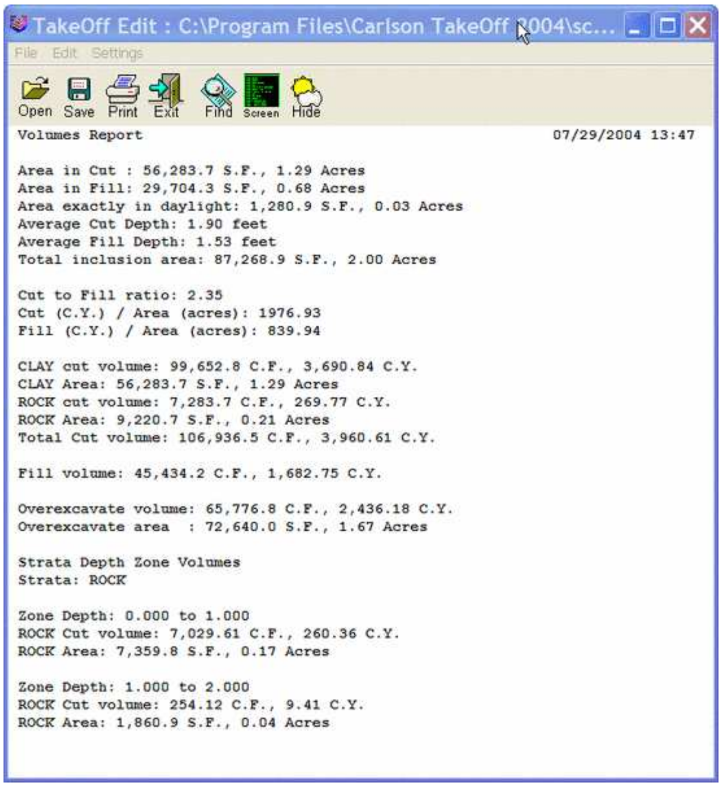
```
Volumes Report

Project: Takeoffdemo2

Date: 03/24/2008 09:59

Initial Surface: C:\Carlson Projects\Takeoffdemo2-ex.tin

Final Surface: C:\Carlson Projects\Takeoffdemo2-fn.tin

                    Bank        Swell/  Adjusted      Area     Average   Change     Import
                    Volume(CY)  Shrink  Volume(CY)   (SqFt)    Depth     Per .1 FT Volume(CY)
-------------------------------------------------------------------------------------------------
Cut                     5451.7   1.000      5451.7  51661.6       2.85    403.6
Fill                    5839.4   1.000      5839.4  57304.2       2.75    403.6     387.7
```

If drillholes have been located on the drawing and strata types and depths have been defined, a calculate Strata Depth Zones Volume option becomes available. Here strata volumes are broken down by user-specified depth intervals. The depths are either determined horizontally (By Level) or by the area of the deepest cut (By Zone Area).


Rock Cut Under 5ft
Rock Cut Over 5ft
Statra Volumes By Level

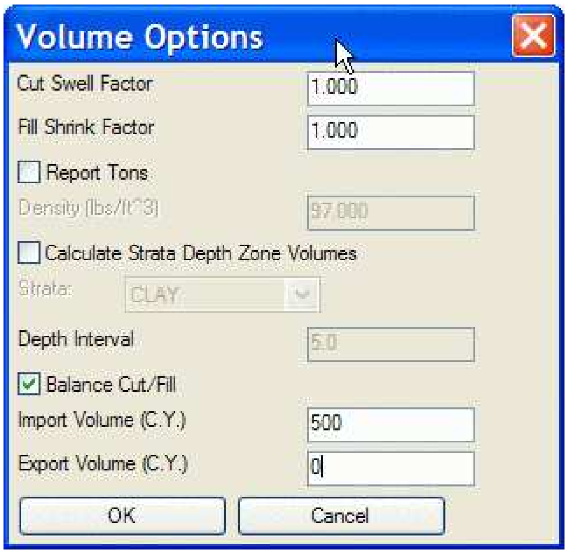

Rock Cut Over 5ft
Under 5ft
Under 5ft
Strata Volumes By Zone Area

Shown here is an example of the report if strata depth intervals have been defined.



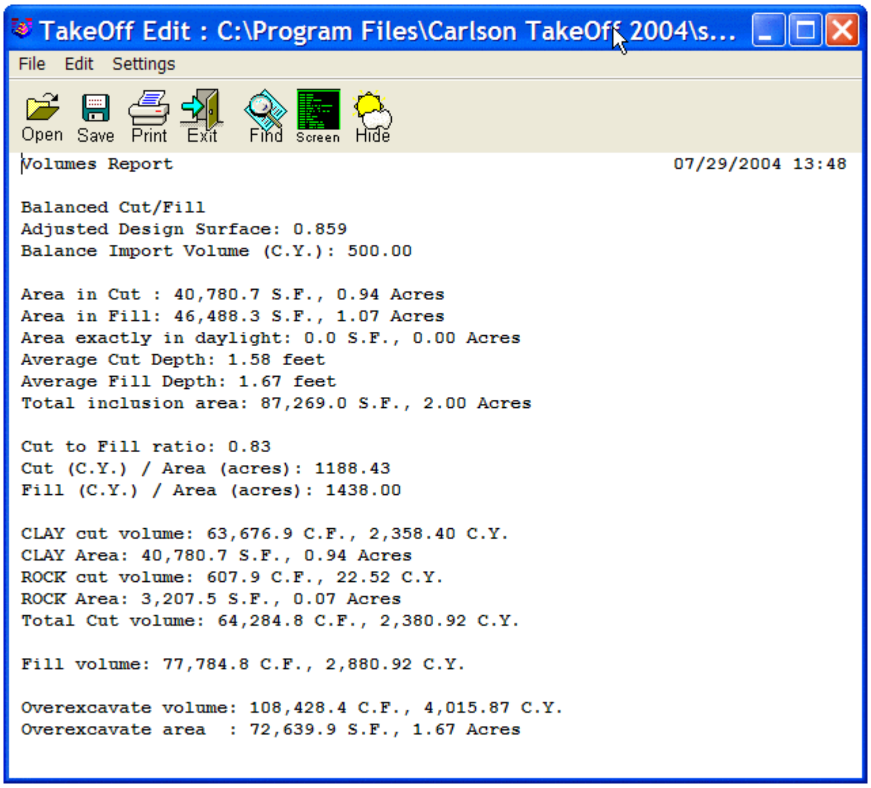
```
Volumes Report                                            07/29/2004 13:47

Area in Cut : 56,283.7 S.F., 1.29 Acres
Area in Fill: 29,704.3 S.F., 0.68 Acres
Area exactly in daylight: 1,280.9 S.F., 0.03 Acres
Average Cut Depth: 1.90 feet
Average Fill Depth: 1.53 feet
Total inclusion area: 87,268.9 S.F., 2.00 Acres

Cut to Fill ratio: 2.35
Cut (C.Y.) / Area (acres): 1976.93
Fill (C.Y.) / Area (acres): 839.94

CLAY cut volume: 99,652.8 C.F., 3,690.84 C.Y.
CLAY Area: 56,283.7 S.F., 1.29 Acres
ROCK cut volume: 7,283.7 C.F., 269.77 C.Y.
ROCK Area: 9,220.7 S.F., 0.21 Acres
Total Cut volume: 106,936.5 C.F., 3,960.61 C.Y.

Fill volume: 45,434.2 C.F., 1,682.75 C.Y.

Overexcavate volume: 65,776.8 C.F., 2,436.18 C.Y.
Overexcavate area  : 72,640.0 S.F., 1.67 Acres

Strata Depth Zone Volumes
Strata: ROCK

Zone Depth: 0.000 to 1.000
ROCK Cut volume: 7,029.61 C.F., 260.36 C.Y.
ROCK Area: 7,359.8 S.F., 0.17 Acres

Zone Depth: 1.000 to 2.000
ROCK Cut volume: 254.12 C.F., 9.41 C.Y.
ROCK Area: 1,860.9 S.F., 0.04 Acres
```

The Balance Cut/Fill option shown here allows an import or export volume in cubic yards option. Use these options if waste material is available or needed elsewhere. If this option is used the resulting report indicates the vertical movement of the site needed to satisfy the balance option.



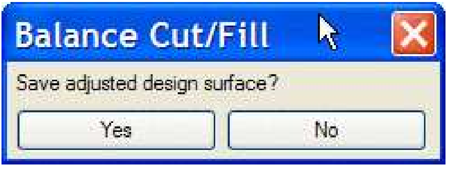
Cut Swell Factor: 1.000
Fill Shrink Factor: 1.000
☐ Report Tons
Density (lbs/ft^3): 97.000
☐ Calculate Strata Depth Zone Volumes
Strata: CLAY
Depth Interval: 5.0
☑ Balance Cut/Fill
Import Volume (C.Y.): 500
Export Volume (C.Y.): 0

Shown here is a report with a 500 CY importation of material and suggests that the site be vertically raised 0.859 feet.



```
Volumes Report                                          07/29/2004 13:48

Balanced Cut/Fill
Adjusted Design Surface: 0.859
Balance Import Volume (C.Y.): 500.00

Area in Cut : 40,780.7 S.F., 0.94 Acres
Area in Fill: 46,488.3 S.F., 1.07 Acres
Area exactly in daylight: 0.0 S.F., 0.00 Acres
Average Cut Depth: 1.58 feet
Average Fill Depth: 1.67 feet
Total inclusion area: 87,269.0 S.F., 2.00 Acres

Cut to Fill ratio: 0.83
Cut (C.Y.) / Area (acres): 1188.43
Fill (C.Y.) / Area (acres): 1438.00

CLAY cut volume: 63,676.9 C.F., 2,358.40 C.Y.
CLAY Area: 40,780.7 S.F., 0.94 Acres
ROCK cut volume: 607.9 C.F., 22.52 C.Y.
ROCK Area: 3,207.5 S.F., 0.07 Acres
Total Cut volume: 64,284.8 C.F., 2,380.92 C.Y.

Fill volume: 77,784.8 C.F., 2,880.92 C.Y.

Overexcavate volume: 108,428.4 C.F., 4,015.87 C.Y.
Overexcavate area  : 72,639.9 S.F., 1.67 Acres
```

If the adjusted surface is satisfactory, Carlson Takeoff offers the option to save the adjusted surface as shown here in the Balance Cut/Fill dialog box.



Save adjusted design surface?

Pulldown Menu Location: Takeoff
Prerequisite: Existing and design surfaces and a boundary polyline
Keyboard Command: tin_volume

Calculate Volumes Inside Perimeter

Use this command to create volume reports inside the selected closed perimeter polyline. The same reporting options are available for this command as are for the Calculate Total Volumes command.

Keyboard Command: tin_volume2
Prerequisite: Existing and Design surfaces and a closed perimeter polyline

Draw 3DPoly Perimeter

This command draws a 3D polyline in the PERIMETER layer. This polyline is required by the *Calculate Stockpile Volume* and *Calculate Pond/Pit Volume* routines. In these routines, this polyline is used as the inclusion perimeter for volumes. You may want to set your AutoCAD Object Snap prior to running this routine so that you obtain the elevations of existing points while creating the 3D polyline.

Prompts

Select the 3Dpolyline options you want and press enter.

```
Command: 3dperim
[Continue/Extend/Follow/Options/<Pick point or point numbers>]: (Pick)
Interpolate/screen Pick/<Elevation> <0.00>: 818
Z: 818.00
[Arc/Close/Direction/Follow/Undo/<Pick point or point numbers>]: (Pick)
Slope/Ratio/Interpolate/Degree/screen Pick/<Elevation> <0.00>: 814
Z: 814.00, Hz dist: 60.64, Slope dist: 60.77, Slope: -6.6% Ratio: -15.2:1
[Arc/Close/Direction/Extend/Follow/Undo/<Pick point or point numbers>]: (Pick)
Slope/Ratio/Interpolate/Degree/screen Pick/<Elevation> <0.00>: 815
Z: 815.00, Hz dist: 26.32, Slope dist: 26.33, Slope: 3.8% Ratio: 26.3:1
[Arc/Close/Direction/Extend/Follow/Undo/<Pick point or point numbers>]:  c for close
```

Pull-Down Menu Location: Tools-> Surface Tools
Keyboard Command: 3dperim
Prerequisite: None

Draw 3DPoly Base Breakline

This command draws a 3D polyline in the BASE_BREAKLINE layer. This polyline is used by the *Calculate Stockpile Volume* and *Calculate Pond/Pit Volume* routines to model the base surface. You may want to set your AutoCAD Object Snap prior to running this routine so that you obtain the elevations of existing points while creating the 3D polyline.

Prompts

Select the 3Dpolyline options you want and press enter.

```
command: 3DBASE
[Continue/Extend/Follow/Options/<Pick point or point numbers>]: (Pick)
Interpolate/screen Pick/<Elevation> <0.00>: 818
Z: 818.00
[Arc/Close/Direction/Follow/Undo/<Pick point or point numbers>]: (Pick)
Slope/Ratio/Interpolate/Degree/screen Pick/<Elevation> <0.00>: 814
Z: 814.00, Hz dist: 60.64, Slope dist: 60.77, Slope: -6.6% Ratio: -15.2:1
[Arc/Close/Direction/Extend/Follow/Undo/<Pick point or point numbers>]: (Pick)
Slope/Ratio/Interpolate/Degree/screen Pick/<Elevation> <0.00>: 815
Z: 815.00, Hz dist: 26.32, Slope dist: 26.33, Slope: 3.8% Ratio: 26.3:1
[Arc/Close/Direction/Extend/Follow/Undo/<Pick point or point numbers>]: (Enter)
```

Pull-Down Menu Location: Tools->Surface Tools
Prerequisite: None
Keyboard Command: 3dbase

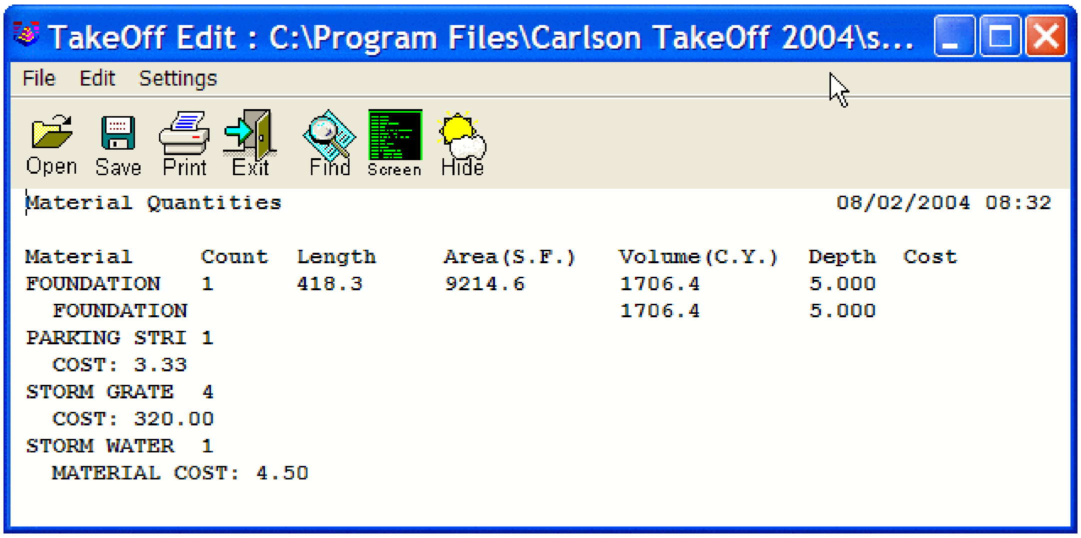
Material Quantities

The Material Quantities flyout shown here offers many options for quantity reporting including the option for user defined attributes. Entities with attributes can be drawn, edited, and identified. Standard and custom report options are also available.

Material Quantities are counted from the entities in the drawing. Several entity properties can be reported including entity count, length, area and volume. Also user-defined attributes can be assigned to the entities and reported. The type of material for each entity is determined by the layer for the entity. In the Define Layer Target/Material/Subgrade, you can assign the material types by layer.

Standard Report

Use this command to display all or a selected set of material quantities and user-defined information with the standard Carlson Takeoff report format shown here.

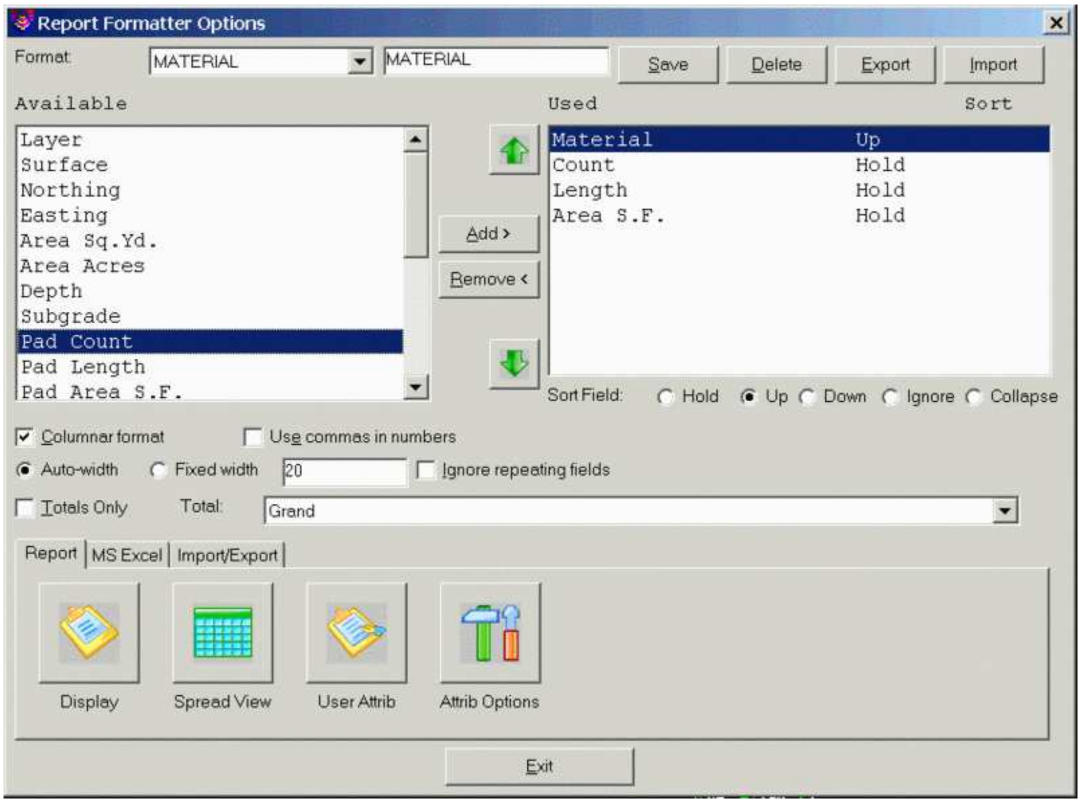


```
Material Quantities                                      08/02/2004 08:32

Material     Count   Length     Area(S.F.)   Volume(C.Y.)  Depth  Cost
FOUNDATION   1       418.3      9214.6       1706.4        5.000
  FOUNDATION                                 1706.4        5.000
PARKING STRI 1
  COST: 3.33
STORM GRATE  4
  COST: 320.00
STORM WATER  1
  MATERIAL COST: 4.50
```

Prerequisite: Defined materials
Keyboard Command: materials_report2

Custom Report

Use this command to customize or "user define" the reporting options. This command first prompts whether to report quantities for all the entities in the drawing or selected entities. Then if the drawing contains Areas Of Interest polylines, there is an option report quantities by these areas which adds the area name to the available report fields to allow sorting and grouping by area name. The Report Formatter Options dialog box shown here offers a variety of output options. You can choose the fields to report from the Available list and put them in report order under the Used list.


Report Formatter Options
Save
Delete
Export
Import
Add >
Remove <
Report
MS Excel
Import/Export
Display
Spread View
User Attrib
Attrib Options
Exit

Format: MATERIAL MATERIAL

Available

Layer
Surface
Northing
Easting
Area Sq.Yd.
Area Acres
Depth
Subgrade
Pad Count
Pad Length
Pad Area S.F.

Used	Sort
Material	Up
Count	Hold
Length	Hold
Area S.F.	Hold

Sort Field: ○ Hold ● Up ○ Down ○ Ignore ○ Collapse

☑ Columnar format ☐ Use commas in numbers

● Auto-width ○ Fixed width 20 ☐ Ignore repeating fields

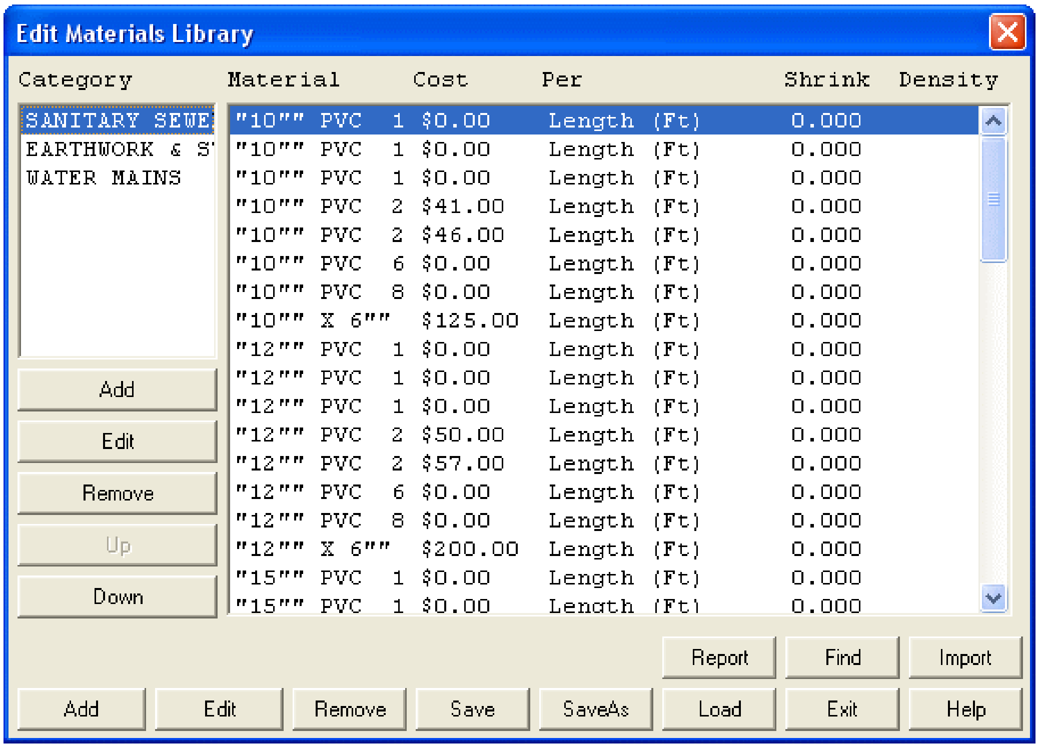
☐ Totals Only Total: Grand

Selecting the Display option shows the report in the standard Carlson Takeoff report viewer. Reports can be exported to an Excel spreadsheet as well.

Prerequisite: Defined materials
Keyboard Command: materials_report

Define Materials Library

Define Materials Library allows you to Add, Remove, Load, Save, and Report a list of material costs. Costs can be set per area, count, volume, ton, or length by using the Edit function at the bottom of the dialog. The left side of the dialog can be used to set categories for different material costs. Material costs can also be Imported from user-specified text files (.txt, .dat, or .csv).



Category

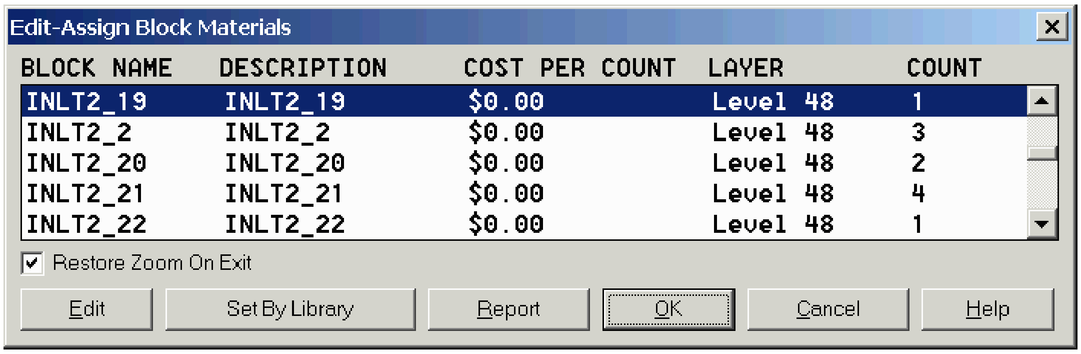
SANITARY SEWE
EARTHWORK & S'
WATER MAINS

Material	Cost	Per	Shrink	Density
"10"" PVC 1	$0.00	Length (Ft)	0.000	
"10"" PVC 1	$0.00	Length (Ft)	0.000	
"10"" PVC 1	$0.00	Length (Ft)	0.000	
"10"" PVC 2	$41.00	Length (Ft)	0.000	
"10"" PVC 2	$46.00	Length (Ft)	0.000	
"10"" PVC 6	$0.00	Length (Ft)	0.000	
"10"" PVC 8	$0.00	Length (Ft)	0.000	
"10"" X 6""	$125.00	Length (Ft)	0.000	
"12"" PVC 1	$0.00	Length (Ft)	0.000	
"12"" PVC 1	$0.00	Length (Ft)	0.000	
"12"" PVC 1	$0.00	Length (Ft)	0.000	
"12"" PVC 2	$50.00	Length (Ft)	0.000	
"12"" PVC 2	$57.00	Length (Ft)	0.000	
"12"" PVC 6	$0.00	Length (Ft)	0.000	
"12"" PVC 8	$0.00	Length (Ft)	0.000	
"12"" X 6""	$200.00	Length (Ft)	0.000	
"15"" PVC 1	$0.00	Length (Ft)	0.000	
"15"" PVC 1	$0.00	Length (Ft)	0.000	

Prerequisite: pricing for materials
Keyboard Command: define_tk_materials

Edit-Assign Block Materials

This command scans the current drawing to find and report block/symbol names and their count. For example, when the drawing contains different symbols for different types of utilities, this command identifies each type of symbol and the number. From this command, you can set the Description and Cost of the block by using the Edit button. You can also set the Description and Cost by predefined Materials by using the Set By Library button. When a block name is highlighted from the list, the drawing is zoomed to the location of one of those blocks so that you can see what it looks like. To Report these materials as part of the Standard Report, check on Include Materials Quantities Report in the Edit Materials dialog of the block layer found in the Define Layer Target/Material/Subgrade command. You can also just click on the Report button for a simple report.



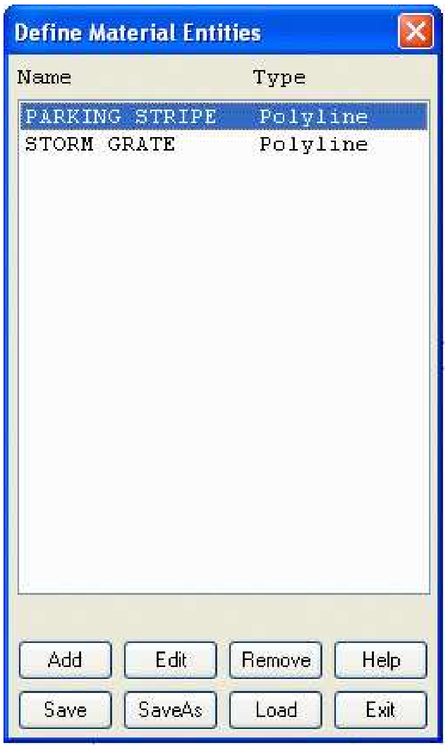
BLOCK NAME	DESCRIPTION	COST PER COUNT	LAYER	COUNT
INLT2_19	INLT2_19	$0.00	Level 48	1
INLT2_2	INLT2_2	$0.00	Level 48	3
INLT2_20	INLT2_20	$0.00	Level 48	2
INLT2_21	INLT2_21	$0.00	Level 48	4
INLT2_22	INLT2_22	$0.00	Level 48	1

☑ Restore Zoom On Exit

Prerequisite: Blocks
Keyboard Command: edit_all_blocks

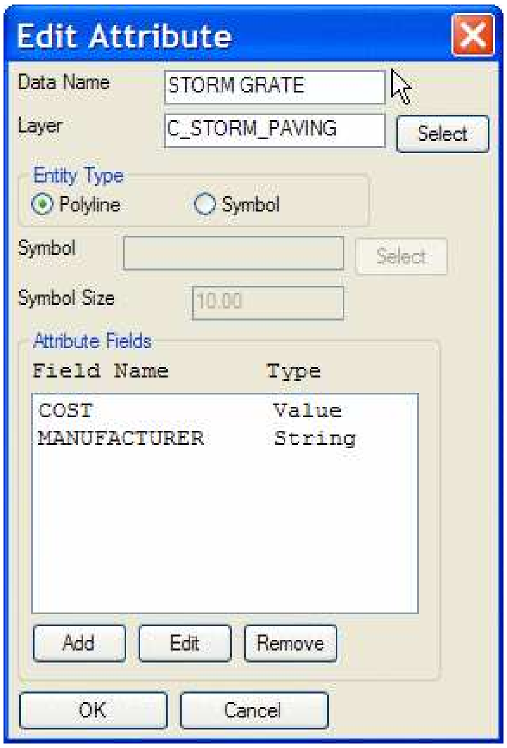
Define Material Attributes

Use this command to define all the material attributes that will be assigned to objects in the drawing for reporting purposes. The Define Attribute dialog box shown here allows the user to "Add", "Edit", or "Remove" attributes and save the definitions for later use. Simply "Load" a saved attribute definition file with the "tkd" extension for future use.


Define Material Entities
Add
Edit
Remove
Help
Save
SaveAs
Load
Exit

Name	Type
PARKING STRIPE	Polyline
STORM GRATE	Polyline

Selecting the Add or Edit options produce the edit attribute dialog box shown here. Use this command to define the Data name and the layer the objects currently reside on and the layer that future objects will be drawn on. Two entity types can be used, polyline data or point data. If the symbol option is selected the user has the option of which symbol will represent the object. Attribute fields must be defined for material reporting.


Edit Attribute
Select
Select
Attribute Fields
Add
Edit
Remove
OK
Cancel

Data Name: STORM GRATE

Layer: C_STORM_PAVING

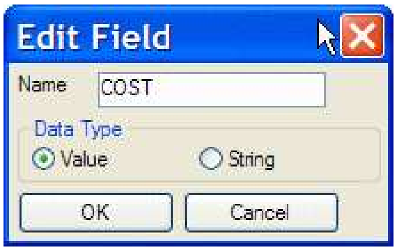
Entity Type: ● Polyline ○ Symbol

Symbol:

Symbol Size: 10.00

Field Name	Type
COST	Value
MANUFACTURER	String

Selecting the Add or Edit button on the Edit Attribute dialog box brings up the Edit Field dialog box shown here. Use this dialog to define the field name and type. If the Value option is selected, only numeric values will be allowed when prompted. If the String option is selected, the user will have the ability to type in a text message when prompted.



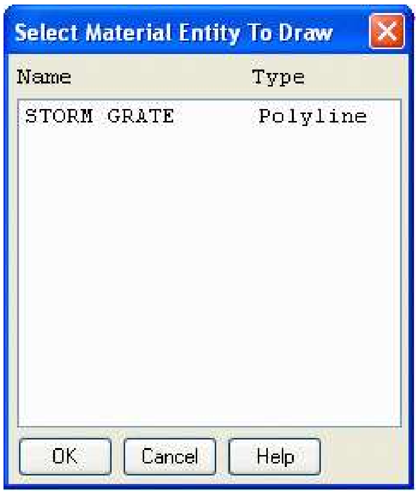
Name: COST

● Value ○ String

Prerequisite: attributes
Keyboard Command: define_tk_data

Draw Materials Entities

Use this command to apply attribute data to objects as you draw or digitize them. Select the predefined attribute type to draw from the list available in the Select Attribute to Draw dialog box shown here.



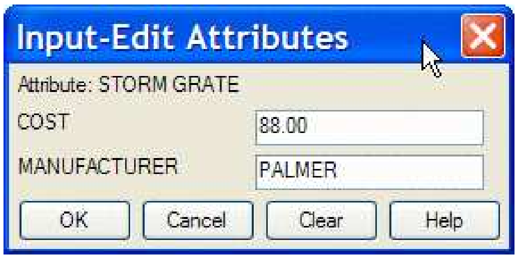
Name	Type
STORM GRATE	Polyline

The command line will prompt the user to pick the points of the desired location of the object and allow the attribute data fields to be filled out upon completion or each "enter".

Prerequisite: defined attributes
Keyboard Command: draw_tk_data

Input-Edit Material Attributes

Use this command to assign predefined attribute information to an object already existing in the drawing. The command line prompt will require the user to select the object that attribute information is to be applied, and offer the Input-Edit Attribute dialog box shown here. This dialog box will display all predefined fields for that particular attribute type.



Attribute: STORM GRATE

COST: 88.00

MANUFACTURER: PALMER

Prerequisite: predefined attribute information
Keyboard Command: edit_tk_data

Identify Materials Entities

Use this command to display all the objects that have attribute data assignments. The user will have the options of selecting the objects by picking them individually or by searching the entire drawing database. The objects that have attribute information assignments will "highlight" on the screen and the command line will display the attribute information.

Prerequisite: attributes
Keyboard Command: id_tk_data

Drillhole Menu

10

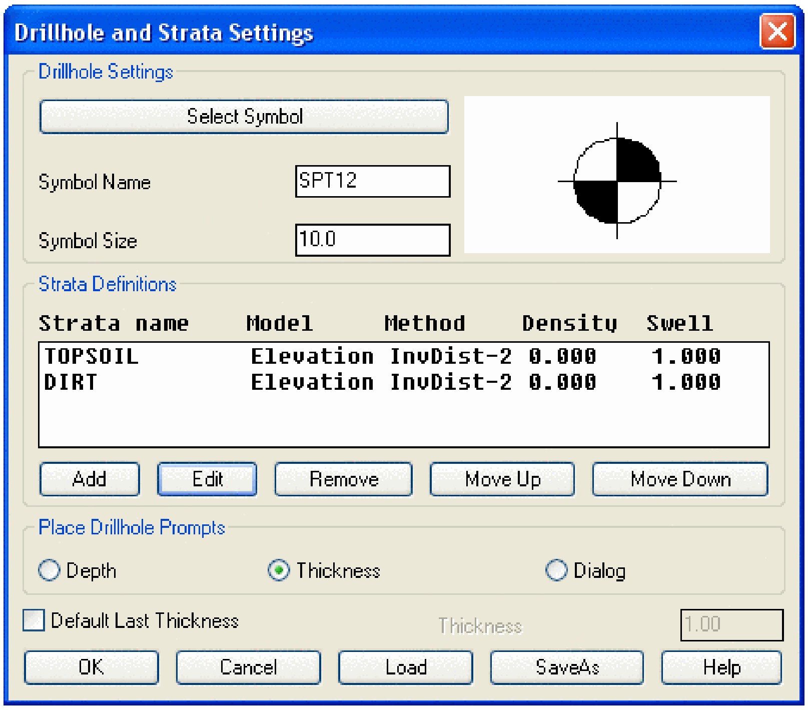
This chapter provides information on using the commands from the Drillhole menu to produce, import and edit drillhole strata settings, place drillholes, make strata surfaces and draw strata surfaces.

Drillhole Strata Settings

This command selects drillhole symbols, defines strata, and determines how you place drillholes.

Note: The order in which the Strata are defined in the Strata Definitions list will be the default order for the strata when you create new drillholes through **Place Drillhole**.

The dialog box below shows the layout of the Drillhole and Strata Settings.


Drillhole and Strata Settings
Drillhole Settings
Select Symbol
Strata Definitions
Add
Edit
Remove
Move Up
Move Down
Place Drillhole Prompts
OK
Cancel
Load
SaveAs
Help

Symbol Name: SPT12

Symbol Size: 10.0

Strata name	Model	Method	Density	Swell
TOPSOIL	Elevation	InvDist-2	0.000	1.000
DIRT	Elevation	InvDist-2	0.000	1.000

○ Depth ● Thickness ○ Dialog

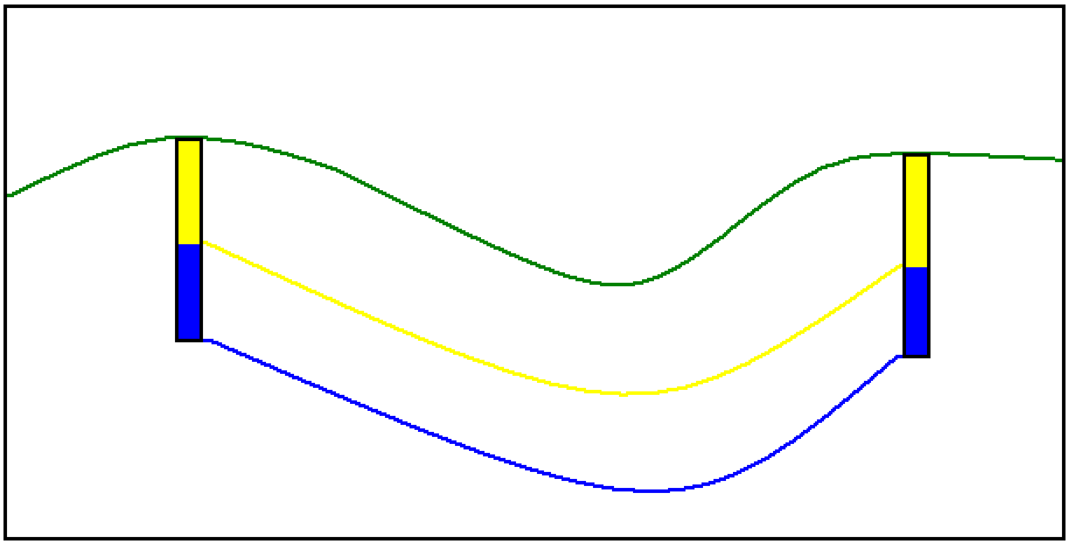
☐ Default Last Thickness

Thickness: 1.00

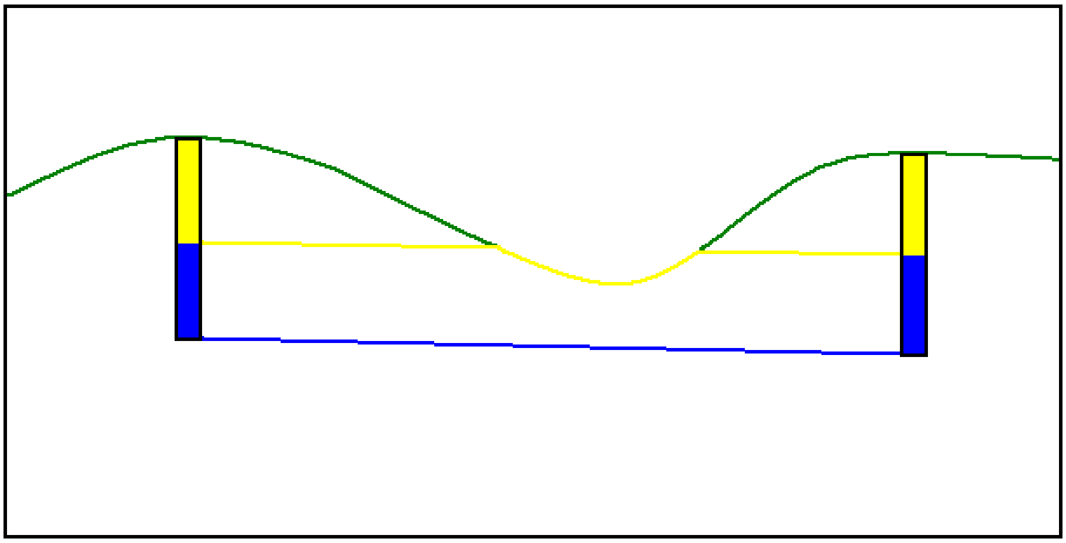
- **Select Symbol**: Select a symbol to represent the drillhole location on the screen.
- **Symbol Name:** This name corresponds to the symbol selected.
- **Symbol Size:** This field can be edited to adjust the symbols size displayed on the screen.
- **Strata Definitions:** This is not directly editable. Select the Strata you are interested by highlighting it, then select the Edit button.
- **Add:** This option adds additional strata to the available Strata name list. See Edit Strata dialog box below.
- **Edit:** Similar to Add, this option is available to make changes to the Strata, including adding a swell factor.
- **Strata Name:** The name of the strata.

Density (lbs/ft^3): The Strata Density field is the default density used to calculate strata tons. Density is strata-specific.

- **By Depth:** This option will generate a strata surface by modeling the strata depth values in the drillholes. This strata surface will follow the existing ground surface at the model depth.



- **By Strata Elevation:** This option will generate a strata model that connects strata irrespective of the upper surface elevation changes.



- **Strata Modeling Method:** There are three ways to model strata by Inverse Distance to the 2nd power, 3rd power, or by linear least squares.

Inverse Distance (Power 2 and Power 3) Modeling Method

Inverse distance calculates the strata model by assigning weights to the drillholes. The strata model calculated by inverse distance are a weighted average of the drillhole data. Inverse distance will not carry trends and the calculated surface model will never be higher than the highest drillhole elevation. Likewise the calculated strata model will never be lower than the lowest drillhole elevation. The weights are proportional to the inverse of the distance between the point to be estimated and a drillhole. Closer drillholes are weighted more than points farther away. The inverse distance can be calculated to the second or third power which are (1/dˆ2), and (1/dˆ3) respectively. Inverse Distance - Power 3 will weigh drillholes less that are further away.

Linear Least Squares Modeling Method

The linear least squares method finds the least squares best fit plane across the surface model. The least squares routine weights each drillhole by inverse distance so that closer points are weighted more than points farther away.

So the best fit plane varies at different points on the surface. The linear least squares method extrapolates trends very well. Least squares will trend and allows for data points that are new highs and lows, that don't appear in the original drillhole data.

- **Remove:** This will remove a strata name from the available strata.
- **Move Up:** This option will move the selected strata name up one place in the strata name list.
- **Move Down:** This option will move the selected strata name down one place in the strata name list.
- **By Strata Elev:** This method will generate a strata surface by modeling the strata elevation values from the drillholes. This strata surface is independent of the existing ground surface.
- **Place Drillhole Prompts:** If Depth is selected, then when you run Place Drillholes you will be prompted for the depth of each strata in your drillhole. If Thickness is selected, you will be prompted for the thickness of each strata. If Dialog is selected, you will go straight into the Place Drillhole dialog when you create a drillhole.
- **Default Last Thickness:** Will set the thickness of your bottom strata to the same amount for all your drillholes.

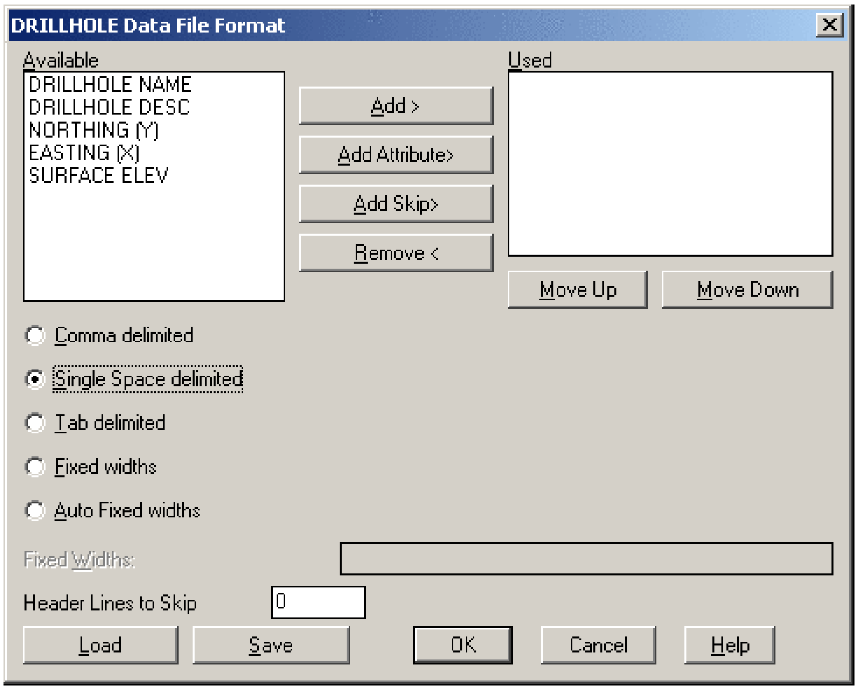
Keyboard Command: tk_chdef
Prerequisite: strata information

Drillhole Import

This command allows you import existing drillhole files. When you select Drillhole Import from the Drillhole menu, a command prompt shows:

"Use separate drillhole and strata files [Yes/<No>]?" If you have two separate files, one with strata info, and the other file has drillhole locations, select Yes. If you enter Yes, the dialog box below appears.

This command creates drillholes from the data contained in text files. Currently there are many company-specific formats. A Drillhole Data File Formatter that is flexible to handle almost any drillhole text file format is below. The format to use is chosen in the dialog shown here.



DRILLHOLE Data File Format

Available:
DRILLHOLE NAME
DRILLHOLE DESC
NORTHING (Y)
EASTING (X)
SURFACE ELEV

Used:

○ Comma delimited
● Single Space delimited
○ Tab delimited
○ Fixed widths
○ Auto Fixed widths

Fixed Widths:

Header Lines to Skip: 0

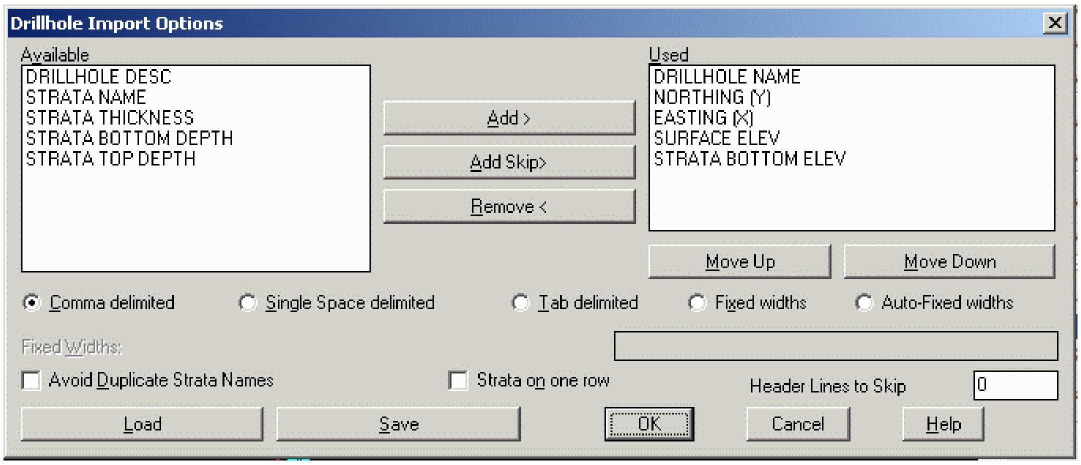
The import text can have comma delimited, space delimited or fixed width columns of data. All the data for a record should be on one row. For the fixed width format, choose the Fixed Width toggle and then enter the column numbers separated by spaces in the edit box. For example, "8 15 24 32".

The Custom format can import all the drillhole and strata data from one text file or the drillhole data from one file and the strata data from another file. The method to use is set at the Use separate drillhole and strata files prompt.

Use the following commands to prepare a file format that will match the ∗.imp imported file.

- **Add:** Moves the selected entry from Available to Used.
- **Add Attribute:** Allows user input attributes into the Used section.
- **Add Skip:** Adds a "Skip" place holder in the Used List
- **Remove:** Moves a selected item from Used to Available list.
- **Move Up:** Moves the selected item up one place in the list.
- **Move Down:** Moves the selected item down one place in the list.
- **Comma Delimited:** Select this if your ∗.imp file has commas separating each field.
- **Single space delimited:** Select this if your ∗.imp has a space separating each field.
- **Tab delimited:** Select this if your ∗,imp file has tabs separating each field.
- **Fixed widths:** Select this if your ∗.imp has a defined width of space separating each field.
- **Auto Fixed widths:** Select this to automatically determine the fixed widths that separate each field in the ∗.imp file.
- **Header Lines to Skip:** If your ∗.imp file has header lines, enter the number of header lines here.
- **Load:** Takes you to select/brows for your ∗.imp file.
- **Save:** This command will save your imported file as a ∗.imp file.

The dialog box below details the drillhole import options.



Drillhole Import Options

Available

DRILLHOLE DESC
STRATA NAME
STRATA THICKNESS
STRATA BOTTOM DEPTH
STRATA TOP DEPTH

Used

DRILLHOLE NAME
NORTHING (Y)
EASTING (X)
SURFACE ELEV
STRATA BOTTOM ELEV

● Comma delimited ○ Single Space delimited ○ Tab delimited ○ Fixed widths ○ Auto-Fixed widths

Fixed Widths:

☐ Avoid Duplicate Strata Names ☐ Strata on one row

Header Lines to Skip: 0

In addition to the previously listed import commands above, this dialog box also has the following prompts:

- **Avoid Duplicate Strata Names:** Select this to prevent have more than one strata with the same name.

- **Strata on one row:** Select this option if all of your strata info is on one row.

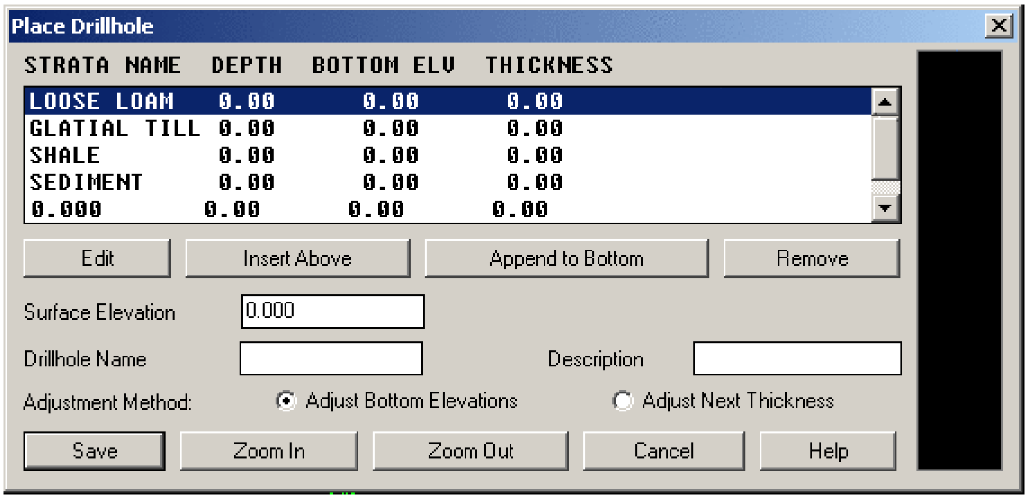
Keyboard Command: tk_chimport
Prerequisite: drillhole files

Place Drillhole

This command allows you to screen pick, enter coordinates or, locate by station-offset the placement of a drillhole.

Go to **Drillhole/Strata Settings**, **Place Drillhole Prompts**, to determine how you would like to be prompted. When you select **Place Drillhole** from the **Drillhole menu**, the command line prompt shows:

"Station/<Pick Drillhole Location>:" Type in x-y coordinates or move your pointer around the screen to pick the placement of the drillhole. To load a centerline file, press S, select the centerline file to reference, then type in the desired Station and Offset amount. If you are in Dialog Mode defined in **Drillhole/Strata Settings**, once a location has been selected, the following dialog box appears:



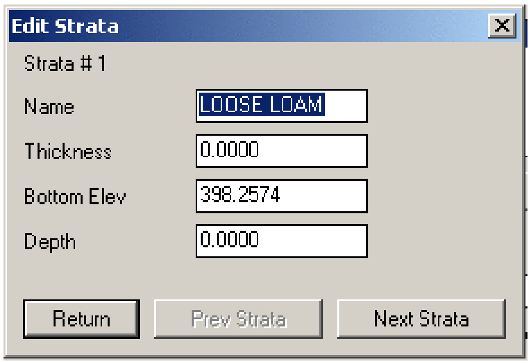
STRATA NAME	DEPTH	BOTTOM ELV	THICKNESS
LOOSE LOAM	0.00	0.00	0.00
GLATIAL TILL	0.00	0.00	0.00
SHALE	0.00	0.00	0.00
SEDIMENT	0.00	0.00	0.00
0.000	0.00	0.00	0.00

Surface Elevation: 0.000
Drillhole Name:
Description:
Adjustment Method: ● Adjust Bottom Elevations ○ Adjust Next Thickness

Place Drillholes generates drillholes in the drawing that are required to run strata surface application routines. Each drillhole consists of a surface elevation, strata, and optional description(s). Every strata has a name, bottom elevation, thickness. Within a drillhole, the strata names must be unique, but each real-world strata should have the same strata name across all the drillholes. This is because strata surface applications connects together the strata with the same name.

The drillhole data can be entered in the dialog shown here, or if Depth or Thickness Mode is selected under **Drillhole/Strata Settings**, then the data can be entered in on the command line when you place each drillhole. Make sure to specify the surface elevation and drillhole description. While in Dialog Mode or to change data, use the Edit and Insert/append buttons to enter strata data. The symbols are defined in DrillHole/Strata Settings and drillhole may be changed in Edit DrillHole. Pick Save when done and a drillhole symbol is drawn.

- **Edit:** Make changes to the highlighted strata name. Thickness, Bottom Elevation, Depth.



Strata # 1

Name LOOSE LOAM

Thickness 0.0000

Bottom Elev 398.2574

Depth 0.0000

When placing drillholes, every strata must be assigned a bottom elevation and a thickness. The bottom elevation is the elevation of the bottom of the strata. There are different methods for entering this information.

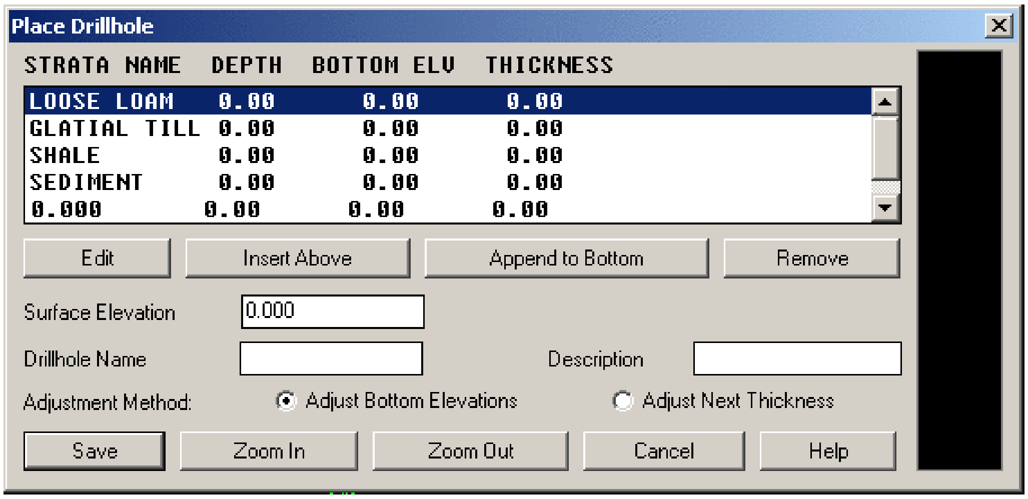
- **Insert Above:** To add a Strata above the highlighted strata name.
- **Append to Bottom:** To add a strata to the bottom of the available strata name list.
- **Remove:** Removes a strata from the available Strata Name list.
- **Surface Elevation:** This field can be set by you to establish the surface elevation of the drillhole.
- **Drillhole Name:** The name of the drillhole
- **Description:** Drillhole descriptions are intended for storing of drillhole specific information in the drillhole. One general drillhole description is predefined and user may define any number of specific drillhole descriptions. Typical additional descriptions are DRILLER, DATE, TOWNSHIP, and etc. You will be prompted for values of these descriptions in Place DrillHole.
- **Adjust Bottom Elevations:** Will make adjustments to the bottom elevation based on thickness changes.
- **Adjust Next Thickness:** Will adjust the next thickness to hold the bottom elevation unchanged.
- **Save:** This command saves this drillhole as listed.
- **Zoom In:** This increases the magnification of the black view window, cross-section view of the drillhole.
- **Zoom Out:** This decreases the magnification of the black view window, cross-section view of the drillhole.
- **Cancel:** Ends Drillhole placement routine without making changes.

Keyboard Command: tk_chplace
Prerequisite: drillhole information

Edit Drillhole

This command allows you to screen pick an existing drillhole and edit its properties. When you select **Edit Drillhole** from the **Drillhole menu**, a command prompt shows:

"Select Drillhole to edit:" Move your pointer around the screen to pick the drillhole you want to edit. Once a drillhole is picked on the screen, the following dialog box appears:



STRATA NAME	DEPTH	BOTTOM ELV	THICKNESS
LOOSE LOAM	0.00	0.00	0.00
GLATIAL TILL	0.00	0.00	0.00
SHALE	0.00	0.00	0.00
SEDIMENT	0.00	0.00	0.00
0.000	0.00	0.00	0.00

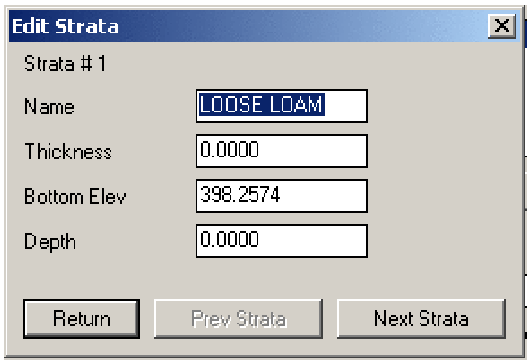
Surface Elevation 0.000

Drillhole Name

Description

Adjustment Method: ● Adjust Bottom Elevations ○ Adjust Next Thickness

- **Edit:** Make changes to the highlighted strata name. Thickness, Bottom Elevation, Depth.



Strata # 1

Name LOOSE LOAM

Thickness 0.0000

Bottom Elev 398.2574

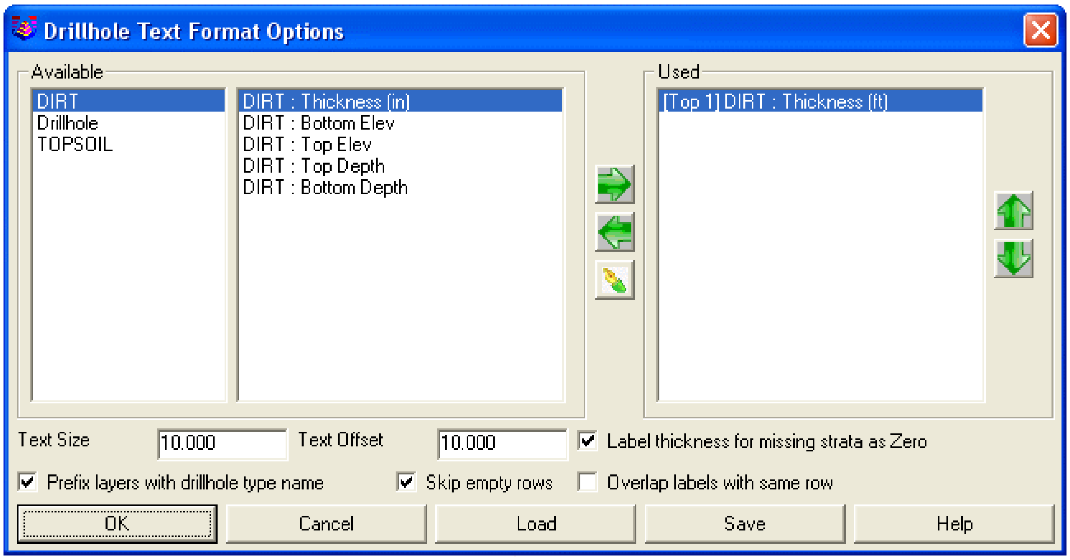
Depth 0.0000

- **Insert Above:** To add a Strata above the highlighted strata name.
- **Append to Bottom:** To add a strata to the bottom of the available strata name list.
- **Remove:** Removes a strata from the available Strata Name list.
- **Surface Elevation:** This field can be set by you to establish the surface elevation of the drillhole.
- **Drillhole Name:** The name of the drillhole
- **Description:** The screen display description of the drillhole
- **Adjust Bottom Elevations:** Will make adjustments to the bottom elevation based on thickness changes.
- **Adjust Next Thickness:** Will adjust the next thickness to hold the bottom elevation unchanged.
- **Save:** This command saves this drillhole as listed.
- **Zoom In:** This increases the magnification of the black view window, cross-section view of the drillhole.
- **Zoom Out:** This decreases the magnification of the black view window, cross-section view of the drillhole.
- **Cancel:** Ends Drillhole placement routine without making changes.

Keyboard Command: tk_chedit
Prerequisite: drillhole information

Label Drillhole

Label Drillhole can be used to label selected properties from drillholes in the current drawing. The first prompt will ask you to select the drillholes you wish to label. To do this, either window around the drillholes you wish to label or type in "all" enter to select all the drillholes in the drawing. Next, a dialog will appear that gives you control on what is displayed in the Labels.


Drillhole Text Format Options

Available

- DIRT
- Drillhole
- TOPSOIL

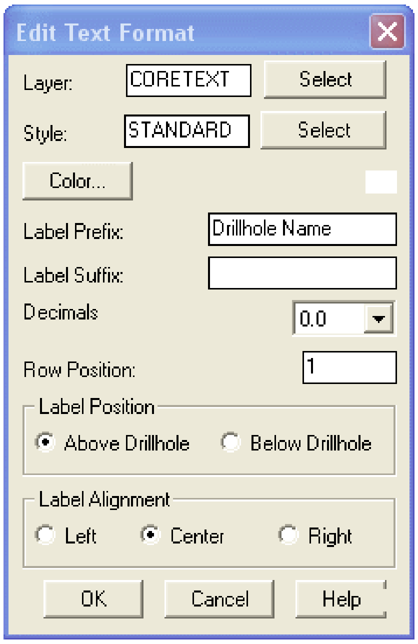
- DIRT : Thickness (in)
- DIRT : Bottom Elev
- DIRT : Top Elev
- DIRT : Top Depth
- DIRT : Bottom Depth

Used

- [Top 1] DIRT : Thickness (ft)

Text Size: 10.000
Text Offset: 10.000
☑ Label thickness for missing strata as Zero
☑ Prefix layers with drillhole type name
☑ Skip empty rows
☐ Overlap labels with same row

On the left side of this dialog are the Available label options for the drillholes. You have control what is shown for each strata surface as well as general drillhole information such as the name and coordinates. Use the arrows in the middle of the dialog to move an Available label option into the Used column on the right. When you do this, the below dialog will appear with more options.

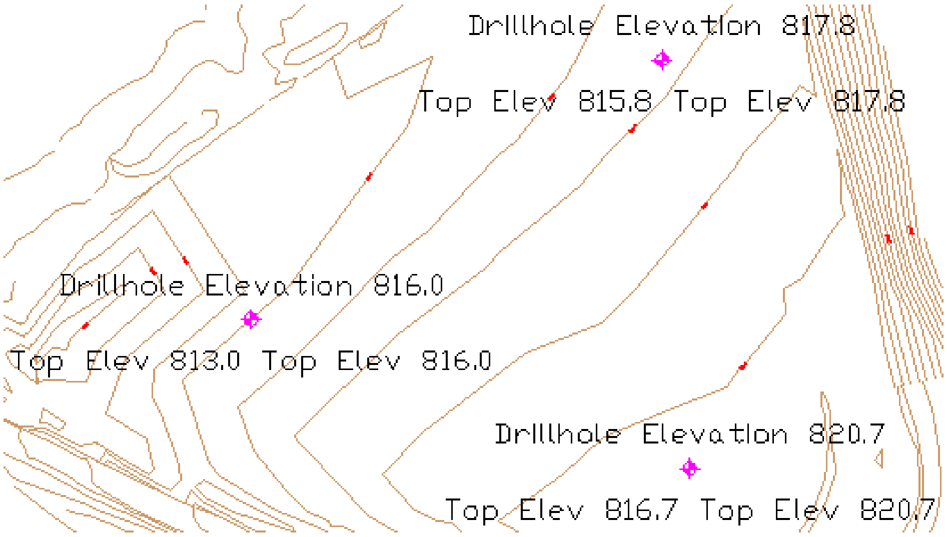

Edit Text Format

Layer: CORETEXT
Style: STANDARD
Label Prefix: Drillhole Name
Label Suffix:
Decimals: 0.0
Row Position: 1

Label Position
● Above Drillhole ○ Below Drillhole

Label Alignment
○ Left ● Center ○ Right

In the Edit Text Format dialog, you can control the Layer, Style, Color, Prefix/Suffix, Decimals, Row Position, and Alignment of text. These items when changed become default the next time the dialog is opened. Here is an example of Drillhole Labels.


Drillhole Elevation 817.8
Top Elev 815.8 Top Elev 817.8
Drillhole Elevation 816.0
Top Elev 813.0 Top Elev 816.0
Drillhole Elevation 820.7
Top Elev 816.7 Top Elev 820.7

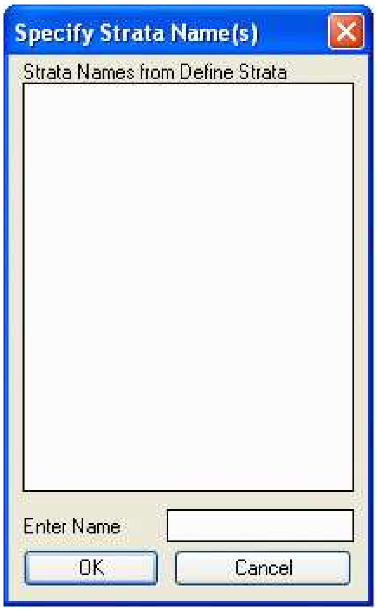
Pulldown Menu Location: Drillhole
Prerequisite: Place Drillhole
Keyboard Command: chtext2

Strata Polylines

Strata Polylines define strata elevation or thickness along linework instead of a single point like Place Drillhole. Linework defined as Strata Polylines are incorporated with Drillhole Data to create surface models. Note: Strata surface models can not be made exclusively from Strata polylines, some drillholes need to be placed as well.

Tag Strata Polylines

This command allows the user to select polylines that define a Strata. Pick the Strata from the list or type in the name in the Enter Name field. Any Strata you enter in must match a strata defined in Drillhole/Strata Settings in order for the surface to be created.


Specify Strata Name(s)
Strata Names from Define Strata
Enter Name
OK
Cancel

After selecting a Strata and pressing enter you will be prompted for the type of polyline.

Type of strata polyline [<Elevation>/Thickness]?

Elevation signifies that the Z value for the polyline(s) you are about to select represent the bottom elevation of the previously selected strata. Thickness means that the Z value represents thickness of the strata. Choose one of these options and select the polylines.

Prerequisite: Drillhole/Strata Settings, desired polylines
Keyboard Command: stratatag

Highlight Strata Polylines

This command allows users to identify Strata Polylines by either picking on a polyline(s) or by searching the entire drawing. The command will then dash the polyline in the plan view.

Prerequisite: Tag Strata Polylines
Keyboard Command: highlight_strata_pl

Identify Strata Polylines

This command allows users to identify topsoil polylines by picking on a polyline. The command will then report the Strata name and Type (either Elevation or Thickness).

Prerequisite: Tag Strata Polylines
Keyboard Command: strataid

Untag Strata Polylines

This command allows the user to remove previously tagged Strata Polylines so that they are not included in the strata model.

Prerequisite: Tag Strata Polylines
Keyboard Command: strauntag

Drillhole Reports

This command allows you to generate a report of selected drillholes. When you select **Reports** from the **Drillhole** menu, a sub-menu choice of **Standard Drillhole Report** or **Custom Drillhole Report**, is displayed.

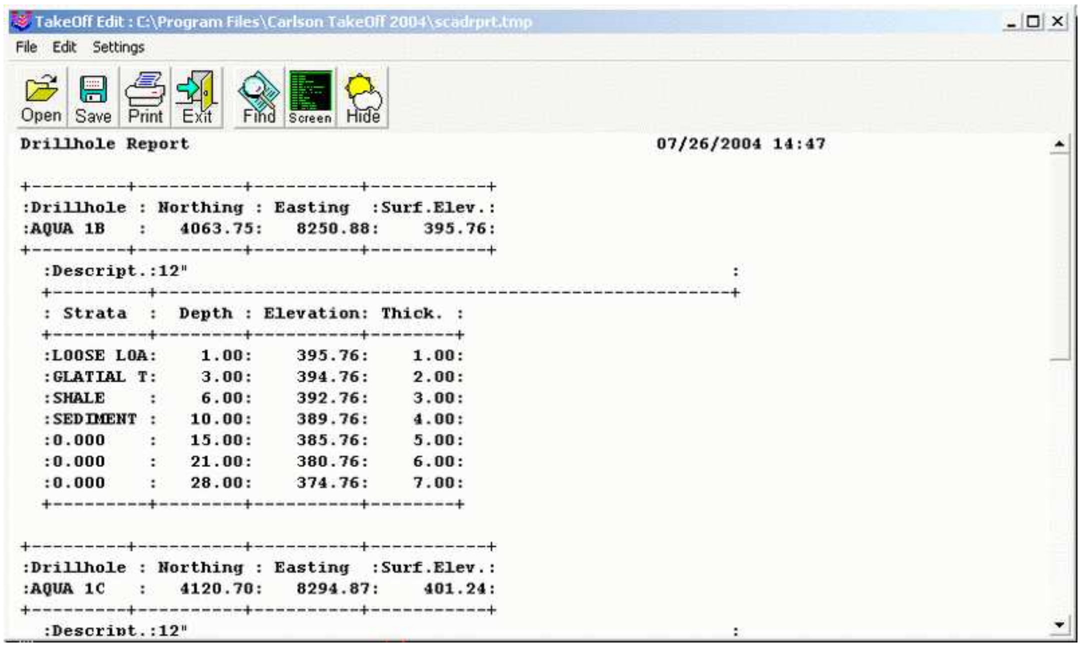
Standard Drillhole Report

If this is selected, several prompts are asked at the command line. They are as follows:

Select objects:

Add Page break between drillholes [Yes/<No>]?
Report Strata depth to [Top/<Bottom>]?

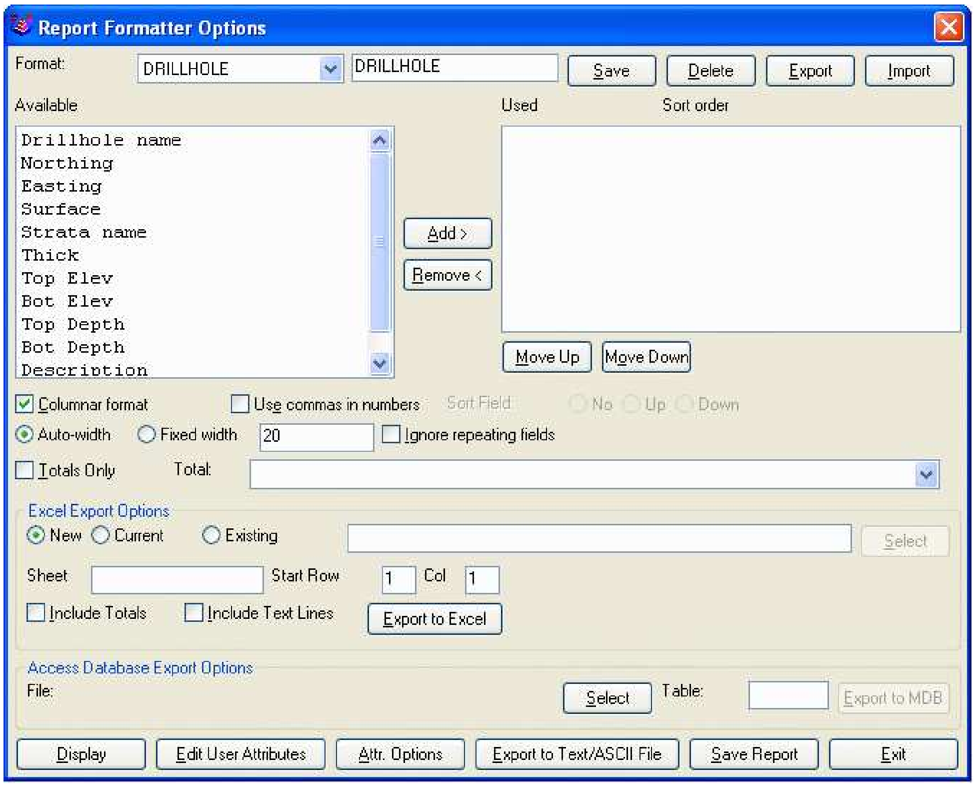
Report Strata elevation of [Top/<Bottom>]?
The report is then displayed accordingly.


TakeOff Edit : C:\Program Files\Carlson TakeOff 2004\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Drillhole Report                                           07/26/2004 14:47

+---------+----------+----------+-----------+
:Drillhole : Northing : Easting  :Surf.Elev.:
:AQUA 1B    :   4063.75:   8250.88:    395.76:
+---------+----------+----------+-----------+
  :Descript.:12"                                                  :
  +---------+-----------------------------------------------------+
  : Strata   :  Depth : Elevation: Thick. :
  +---------+--------+----------+--------+
  :LOOSE LOA:    1.00:     395.76:    1.00:
  :GLATIAL T:    3.00:     394.76:    2.00:
  :SHALE    :    6.00:     392.76:    3.00:
  :SEDIMENT :   10.00:     389.76:    4.00:
  :0.000    :   15.00:     385.76:    5.00:
  :0.000    :   21.00:     380.76:    6.00:
  :0.000    :   28.00:     374.76:    7.00:
  +---------+--------+----------+--------+

+---------+----------+----------+-----------+
:Drillhole : Northing : Easting  :Surf.Elev.:
:AQUA 1C    :   4120.70:   8294.87:    401.24:
+---------+----------+----------+-----------+
  :Descript.:12"                                                  :
```

Custom Drillhole Report

This function allows you to customize your report format.


Report Formatter Options
Save
Delete
Export
Import
Available
Used
Sort order
Add >
Remove <
Move Up
Move Down
Sort Field
Select
Export to Excel
Select
Export to MDB
Display
Edit User Attributes
Attr. Options
Export to Text/ASCII File
Save Report
Exit

Format: DRILLHOLE DRILLHOLE

Available:
- Drillhole name
- Northing
- Easting
- Surface
- Strata name
- Thick
- Top Elev
- Bot Elev
- Top Depth
- Bot Depth
- Description

☑ Columnar format ☐ Use commas in numbers ○ No ○ Up ○ Down
● Auto-width ○ Fixed width 20 ☐ Ignore repeating fields
☐ Totals Only Total:

Excel Export Options
● New ○ Current ○ Existing
Sheet Start Row 1 Col 1
☐ Include Totals ☐ Include Text Lines

Access Database Export Options
File: Table:

Prompts:

Command: tk_chreport2
Select the Drillholes for report.

Select objects: Specify opposite corner: 271 found
262 were filtered out.

Keyboard Command: tk_chreport, tk_chreport2
Prerequisite: drillholes

Make Strata Surface

This command generates multiple strata surfaces based on strata definitions and placements of drillholes. Strata surfaces are generated at the bottom of each strata. These strata surfaces can then be used in other TakeOff commands like **Calculate Total Volumes**. They can be viewed on screen, through the command **Draw Strata Surface**.

Note: By observing the command line, one can see the status of each strata surface generation.

Keyboard Command: tk_chgrid
Prerequisite: Define Drillhole/Strata Settings, Place Drillhole

Clear Strata Surface

This command clears the strata surfaces previously generated with **Make Strata Surface**. This removes the strata surfaces from processing in other takeoff commands.

Note: This command will not remove the surface from the screen view. You must use the command **Erase Strata Surface** to remove them from view.

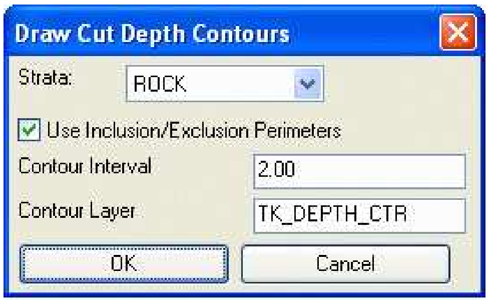
Keyboard Command: tk_chclear
Prerequisite: Make Strata Surface

Draw Strata Cut Depth Contours

This command will draw the **Strata Cut Depth Contours**. This command creates contours for the cut depth between the design surface and strata.

You must have created Strata Surfaces through the **Make Strata Surface** command.

Then select **Draw Strata Cut Depth Contours** from the **Drillhole menu**. You will be prompted to select the Strata from the dialog box below.



Strata: ROCK

☑ Use Inclusion/Exclusion Perimeters

Contour Interval: 2.00

Contour Layer: TK_DEPTH_CTR

You can assign a contour interval and contour layer for the contours to be drawn. If **Use Inclusion/Exclusion Perimeters** is checked on you will be prompted for an Inclusion polyline and a Exclusion polyline if needed, otherwise the drawing's Boundary linework will be used.

Keyboard Command: tk_chdepth
Prerequisite: Make Strata Surface

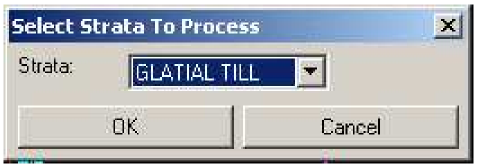
Erase Strata Cut Depth Contours

This command will erase the Strata Cut Depth Contours from the screen display.

Keyboard Command: tk_chdepth2
Prerequisite: Strata Cut Depth Contours

Draw Strata Cut Color Map

This command will generate a map of areas where the design surface cuts into the selected strata.



Strata: GLATIAL TILL

Prompts

Select point for color legend: - Use your pointing device to select the top left corner of where you want the cut color legend to be displayed.

Legend size <10.0>: Screen display size.
Label all zones or summary [All/<Summary>]? This pertains to the number of elevation labels on the legend.

Keyboard Command: tk_chmap
Prerequisite: Make Strata Surface

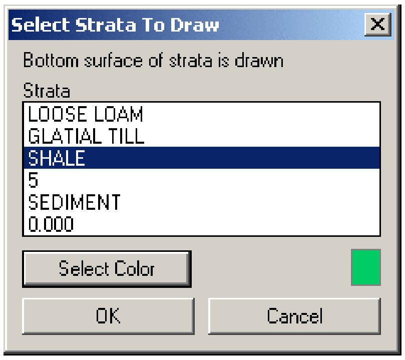
Erase Strata Cut Color Map

This command will erase all Strata Cut Color information from the screen display.

Keyboard Command: tk_chmap2
Prerequisite: Draw Strata Cut Color Map

Draw Strata Surface

This command will display the selected strata surfaces as 3D faces. The bottom elevation of the strata is drawn.


Select Strata To Draw
Bottom surface of strata is drawn
Strata
LOOSE LOAM
GLATIAL TILL
SHALE
5
SEDIMENT
0.000
Select Color
OK
Cancel

A color can be selected to distinguish each strata.

Keyboard Command: tk_chplot
Prerequisite: Make Strata Surface

Erase Strata Surface

This command will erase all strata surface 3D faces from the screen display.

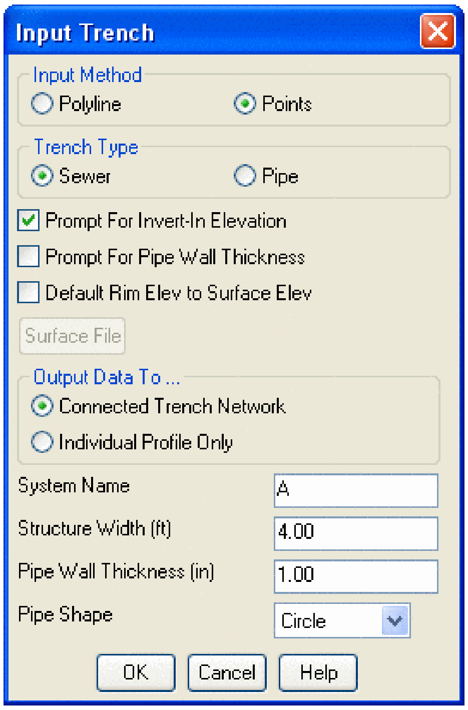
Keyboard Command: tk_chplot2
Prerequisite: Draw Strata Surface

Trench Menu

11

Input Trench From Polyline

This command allows you to input a trench sewer network structure from polylines or points. It first prompts you the **Input Trench Line Dialog** where you specify the Trench Type, Trench System, and the System Name. The Individual Profile option lets you input one trench reach at a time and save its information to a profile (.pro). The Connected Network option lets you input all the trench polylines on the drawing, merge them into a trench network structure and save the whole structure to a .sew file. For trenching or utilities without Invert-Ins, uncheck Prompt For Invert-In Elevation. If you want to set the Rim Elevation to any surface elevations, check on Default Rim Elev to Surface Elev and then use the Surface Button to select the desired .tin or .flt surface file. Prompt For Pipe Wall Thickness allows you to enter in the pipe thickness that will be used in calculating backfill quantities in two prompts: 1) the interior pipe size and, 2) the thickness of the pipe wall. If this is check off, the value in Pipe Wall Thickness will be automatically added to the Pipe Size for backfill volumes. You can also enter in a Structure Width to be considered in the Cut volumes. Pipe Shape determines the prompting so that you can create Circular, Elliptical, or Rectangular pipe. Click OK to start inputting trench structures.


Input Trench

Input Method
○ Polyline ● Points

Trench Type
● Sewer ○ Pipe

☑ Prompt For Invert-In Elevation
☐ Prompt For Pipe Wall Thickness
☐ Default Rim Elev to Surface Elev

Output Data To ...
● Connected Trench Network
○ Individual Profile Only

System Name: A
Structure Width (ft): 4.00
Pipe Wall Thickness (in): 1.00
Pipe Shape: Circle

There are two different types of Input Methods in this command: Polyline or Points. Points allows you to pick freely the location of each sewer structure. With the polyline method, Takeoff extracts the coordinates of all the vertices of the polyline to determine the location of the structures. With both methods you are prompted for the starting station number. Takeoff computes the station values based on the starting station number. Next, you are prompted to enter the Manhole ID (Sewer Trench) or Station ID (Pipe Trench), Invert Elevation, Manhole Elevation (Sewer Trench), and Pipe Size or Pipe Group for every station. You can either enter the values manually or select the texts that represent these values on the drawing. When you finish inputting a polyline, the command would ask you for a profile name to store the profile data if you are doing Individual Profile; otherwise the command would ask you to pick next polyline that is in the same trench network.

Prompts:

Pick a polyline that represents a trench reach: *pick a polyline on your drawing*
Starting Station of trench reach <0.0>: *press Enter to accept 0.0 as the starting station or enter a value*

For station 0.00 ...
Enter/<Select text of Manhole ID>: *select the Manhole ID text on the drawing or enter Enter on the keyboard to enter the Manhole ID value manually*

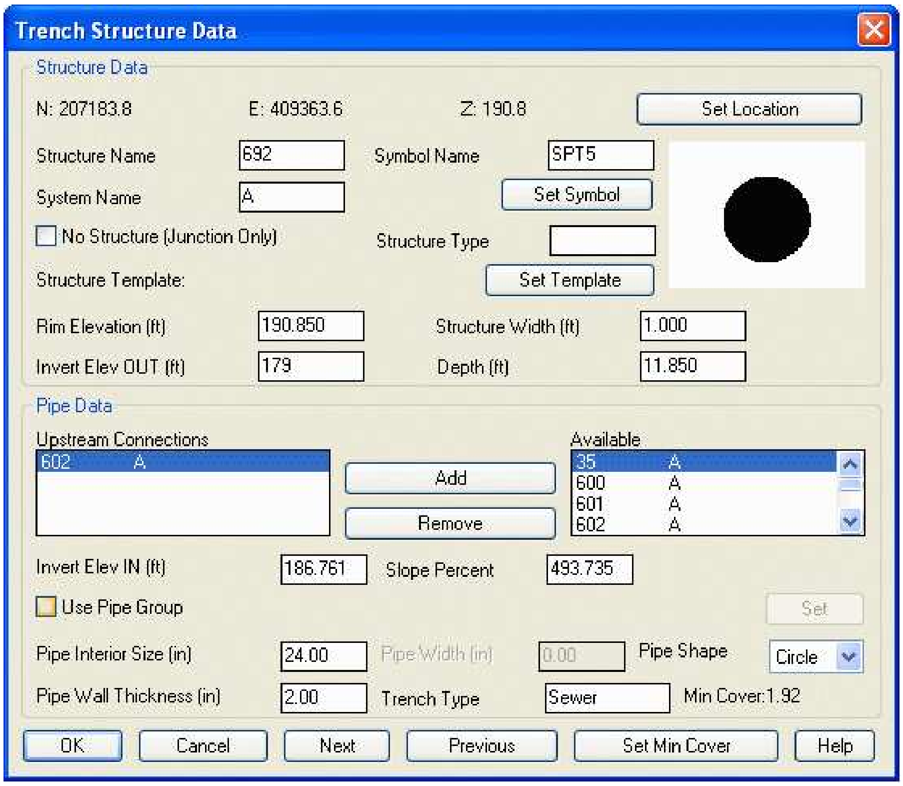
Enter/<Select text of invert elevation>: *select the invert elevation text on the drawing or enter Enter on the keyboard to enter the invert elevation value manually*
Enter/<Select text of manhole elevation>: *select the manhole elevation text on the drawing or enter Enter on the keyboard to enter the manhole elevation value manually*
For station 270.22 ...
Enter/<Select text of Manhole ID>: *select the Manhole ID text on the drawing or enter Enter on the keyboard to enter the Manhole ID value manually*
Enter/<Select text of invert elevation>: *select the invert elevation text on the drawing or enter Enter on the keyboard to enter the invert elevation value manually*
Enter/<Select text of manhole elevation>: *select the manhole elevation text on the drawing or enter Enter on the keyboard to enter the manhole elevation value manually*
Undo/Select/Group/<Enter Pipe Size <0.0000>>: *select the pipe size text on the drawing or enter Enter on the keyboard to enter the pipe size value manually or select Group to enter in a Pipe Group*
For station 425.02 ...
Enter/<Select text of Manhole ID>: *select the Manhole ID text on the drawing or enter Enter on the keyboard to enter the Manhole ID value manually*
Enter/<Select text of invert elevation>: *elect the invert elevation text on the drawing or enter Enter on the keyboard to enter the invert elevation value manually*
Enter/<Select text of manhole elevation>: *select the manhole elevation text on the drawing or enter Enter on the keyboard to enter the manhole elevation value manually*
Undo/Select/Group/<Enter Pipe Size <0.0000>>: *select the pipe size text on the drawing or enter Enter on the keyboard to enter the pipe size value manually or select Group to enter in a Pipe Group*
For station 649.73 ...
Enter/<Select text of Manhole ID>: *select the Manhole ID text on the drawing or enter Enter on the keyboard to enter the Manhole ID value manually*
Enter/<Select text of invert elevation>: *elect the invert elevation text on the drawing or enter Enter on the keyboard to enter the invert elevation value manually*
Enter/<Select text of manhole elevation>: *select the manhole elevation text on the drawing or enter Enter on the keyboard to enter the manhole elevation value manually*
Undo/Select/Group/<Enter Pipe Size <0.0000>>: *select the pipe size text on the drawing or enter Enter on the keyboard to enter the pipe size value manually or select Group to enter in a Pipe Group*
Another Polyline [<Yes>/No]? *enter Yes to input another trench reach from a polyline or enter No to finish*

At the end of the command, a file opening dialog would be prompted to you to specify a .sew file name to store the trench network structure.

Prerequisite: A drawing with one or more polylines that represent the trench structure.
Keyboard Command: pline_trench

Create Trench Network Structure

This command allows you to create or modify a trench network structure on a drawing. Before you are able to locate the trench structure, the drawing has to be open, has been cleaned up and pre-processed by such commands as Define Layer Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface. You can locate the trench structure by one of three methods: picking points on the drawing, entering the point number, or specifying the station and offset of a centerline. If you use centerline method, you need to specify a centerline file. After you locate a point on the drawing, you are prompted the **Sewer Structure Data Dialog** for entering the sewer structure information, such as Structure Name, System Name, Symbol Name, and Elevations. Take a look at the list of the trench points that have been defined. If there is any point that is connected upstream to the current point, you add it to the Upstream Connections list. The Invert Elevation and the Pipe Size fields will be filled with the information of the upstream point. Use Pipe Group allows you to set multiple pipes for the trench run by using a existing or new Pipe Group. Click OK to finish entering the trench structure data. The command will repeatedly ask you to pick a structure point until you hit **Enter** to finish. The trench network structure data is saved in a .sew file.



Structure Data

N: 207183.8 E: 409363.6 Z: 190.8

Structure Name: 692
Symbol Name: SPT5
System Name: A
☐ No Structure (Junction Only)
Structure Type:
Structure Template:
Rim Elevation (ft): 190.850
Structure Width (ft): 1.000
Invert Elev OUT (ft): 179
Depth (ft): 11.850

Pipe Data

Upstream Connections	Available
602 A	35 A 600 A 601 A 602 A

Invert Elev IN (ft): 186.761
Slope Percent: 493.735
☐ Use Pipe Group
Pipe Interior Size (in): 24.00
Pipe Width (in): 0.00
Pipe Shape: Circle
Pipe Wall Thickness (in): 2.00
Trench Type: Sewer
Min Cover:1.92

Prompts

By Pick:

Locate by pick point, point number or station-offset [<Pick>/Number/CL]? *press Enter to do Pick point*

Loading edges...
Loaded 4 points and 5 edges
Created 2 triangles

Pick structure location: *pick a point*
Sewer Structure Data Dialog: *enter trench structure information*
Pick structure location (Enter to end): *pick a point*
Sewer Structure Data Dialog: *enter trench structure information*
Pick structure location (Enter to end): *pick a point*
Sewer Structure Data Dialog: *enter trench structure information*
Pick structure location (Enter to end): *pick a point*
Sewer Structure Data Dialog: *enter trench structure information*
Pick structure location (Enter to end): *press Enter to finish*

By station-offset of CL:

Locate by pick point, point number or station-offset [<Pick>/Number/CL]? CL (enter CL to do locating trench structure by station-offset of a centerline)

Specify a centerline file.

Loading edges...
Loaded 4 points and 5 edges
Created 2 triangles

Structure Station: 0 *(enter the station number on the centerline)*
Structure Offset: 200 *(enter the offset from the centerline)*
Sewer Structure Data Dialog: *enter trench structure information*
Structure Station (Enter to end): 100 *(enter the station number on the centerline)*
Structure Offset: 200 *(enter the offset from the centerline)*
Sewer Structure Data Dialog: *enter trench structure information*
Structure Station (Enter to end): *press Enter to finish*

Prerequisite: Your drawing is open, has been cleaned up and pre-processed by such commands as Define Layer Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface.
Keyboard Command: locate_trench

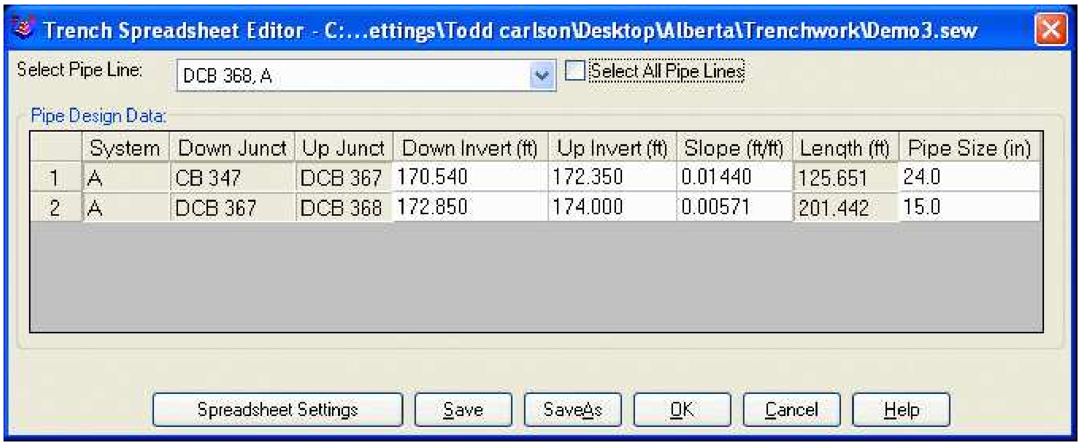
Edit Trench Network Structure

This command edits the existing trench structure data on the drawing. There has to be a trench network structure that has been created beforehand and its data is store in a .sew file whose name is as same as the drawing name. The command first prompts you to pick a sewer structure on the drawing. If there is no such structure in the .sew file, you would get a error message like this: "Error: unable to locate structure in file C:\temp\takeoff\SANI1x.sew, otherwise this command will restore the trench structure data from the corresponding .sew file and display it on the Sewer Structure Data Dialog for editing. Click OK to confirm your modification. You are prompted to edit another structure point until you press Enter to finish. All modifications are saved in the .sew file.
Set Location will return you to the plain view and prompt you for a new location for the structure by either typing in the coordinates or picking on the screen. In the dialog you can change the Structure Name, Symbol, Width, Depth, and Type. Setting a Structure Template will allow you to set the dimensions of the Structure with a .tch file. See Input-Edit Trench Template for details on creating a .tch file. Here you can also manage how the Structure is connect to other Structures. Under Upstream Connections you will see the Structure(s) currently connected to upstream and a list of available Structures on the right. Pick Add to connect to a Structure you have selected under Available, and Remove to disconnect to any selected Structures. Other options are to edit the Rim Elevation, Invert In and Out, as well as Pipe information between your Structure and the highlighted Upstream Connection. Use Pipe Group allows you to set multiple pipes for the trench run by using a existing or new Pipe Group. Min Cover shows you the depth between the Design Surface and top of pipe. Set Min Cover will adjust your Invert In and Out elevations so that you have at least the value you enter as the Min Cover.

Prerequisite: Your drawing is open, has been cleaned up and pre-processed by such commands as Define Layer Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface. Trench structure data has been stored in a .sew file, whose name is as same as the drawing name.
Keyboard Command: edit_trench

Trench Spreadsheet Editor

This command allows you to view and edit existing trench network data in spreadsheet form. Upon running the command, the program will open the .sew file associated with the drawing, or if one has not been established, you will be prompted to select one.



Trench Spreadsheet Editor - C:...ettings\Todd carlson\Desktop\Alberta\Trenchwork\Demo3.sew

Select Pipe Line: DCB 368, A

☐ Select All Pipe Lines

Pipe Design Data:

	System	Down Junct	Up Junct	Down Invert (ft)	Up Invert (ft)	Slope (ft/ft)	Length (ft)	Pipe Size (in)
1	A	CB 347	DCB 367	170.540	172.350	0.01440	125.651	24.0
2	A	DCB 367	DCB 368	172.850	174.000	0.00571	201.442	15.0

The Trench Spreadsheet Editor allows you to select the Pipe Line you want to edit, or view all the Pipe Lines at once by checking on "Select All Pipe Lines". After selecting a Pipe Line, each segment of the Pipe Line will be displayed as: the downstream connection (Down Junct), upstream connection (Up Junct), the invert in of the downstream manhole (Down Invert), the invert out of the upstream manhole (Up Invert), and the Slope, Length and Pipe Size between the two. Any value between two manholes can be edited except for the Length. Spreadsheet Settings allows you to choose what elements of a segment are displayed.

Click OK to confirm your modification. All modifications are saved in the .sew file.

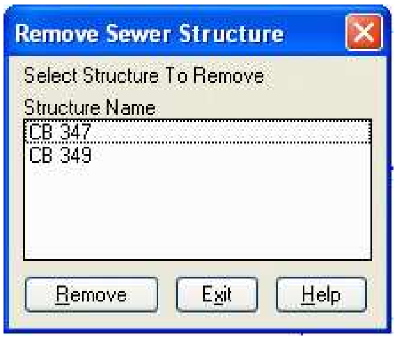
Prerequisite: Sewer Network File
Keyboard Command: edit_trench2

Remove Trench Network Structure

This command removes the existing trench structure data. There has to be a trench network structure that has been created beforehand and its data is store in a .sew file whose name is as same as the drawing name. The command first prompts you to pick a sewer structure on the drawing or to select from a List of your Sewer Structures. If there is no such structure in the file, you will get a error message like this: "Error: unable to locate structure in file C:\temp\takeoff\SANI1x.sew, otherwise this command removes the structure from both the drawing and the .sew file immediately. You are prompted to remove another structure point until you press **Enter** to finish. The removed trench structure points would no longer be found in the .sew file.

Prompts

Select structures to erase by screen pick or name list [<Pick>/List]? Pick to choose from the screen, or List to choose from the below dialog.



Remove Sewer Structure

Select Structure To Remove

Structure Name

CB 347
CB 349

Prerequisite: Your drawing is open, has been cleaned up and pre-processed by such commands as Define Layer

Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface. Trench structure data has been stored in a .sew file, whose name is as same as the drawing name.
Keyboard Command: remove_trench

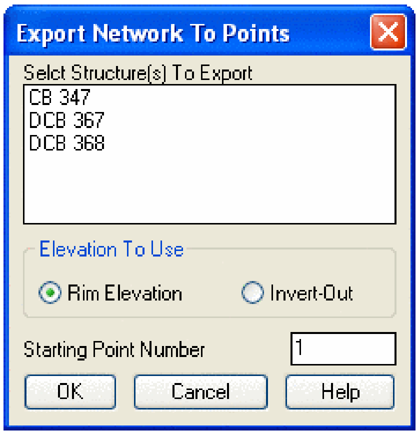
Find Trench Network Structure

This command will center the screen and draw an arrow to the structure you specify.

Prerequisite: a Trench Network
Keyboard Command: findswr

Export Trench Network Data

Export to Points



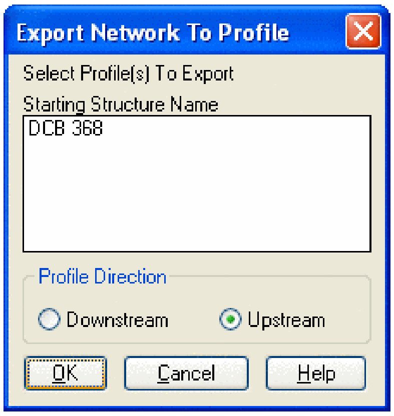
Selct Structure(s) To Export
CB 347
DCB 367
DCB 368

Elevation To Use
● Rim Elevation ○ Invert-Out

Starting Point Number: 1

This command will add points at your trench structures and add them into your coordinate file by either the Rim Elevation or the Invert-Out.

Export to Profiles



Select Profile(s) To Export
Starting Structure Name
DCB 368

Profile Direction
○ Downstream ● Upstream

This command will create a profile file (.pro) of your trench either going Upstream or Downstream. The (.pro) file can then be drawn under Roads->Draw Profile.

Prerequisite: a Trench Network
Keyboard Command: swr2pts, swr2pro

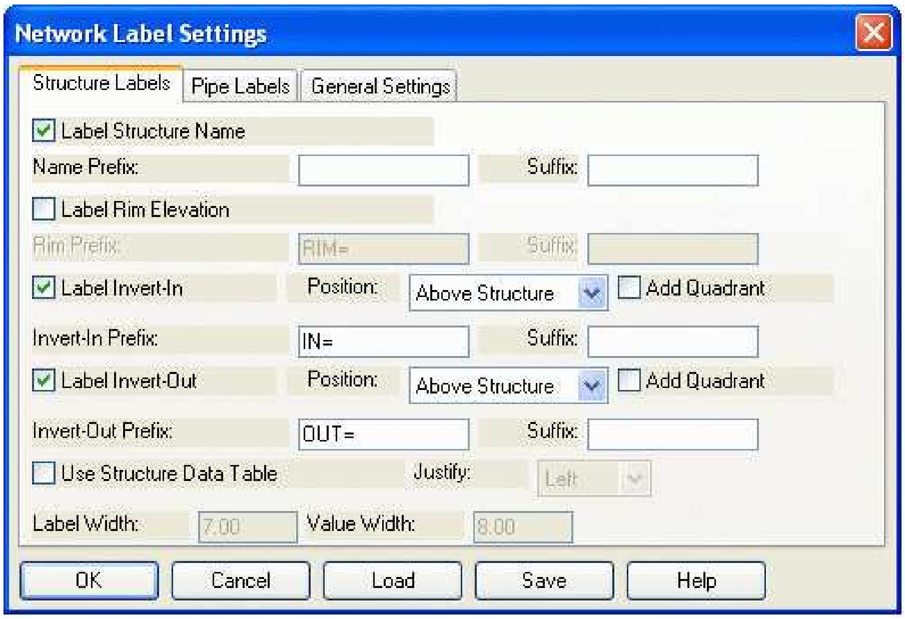
Trench Network File Backup

Save Trench Network File saves your trench network as a (.sew) file. *Load Trench Network File* loads a previously saved (.sew) file.

Prerequisite: none
Keyboard Command: save_trench, load_trench

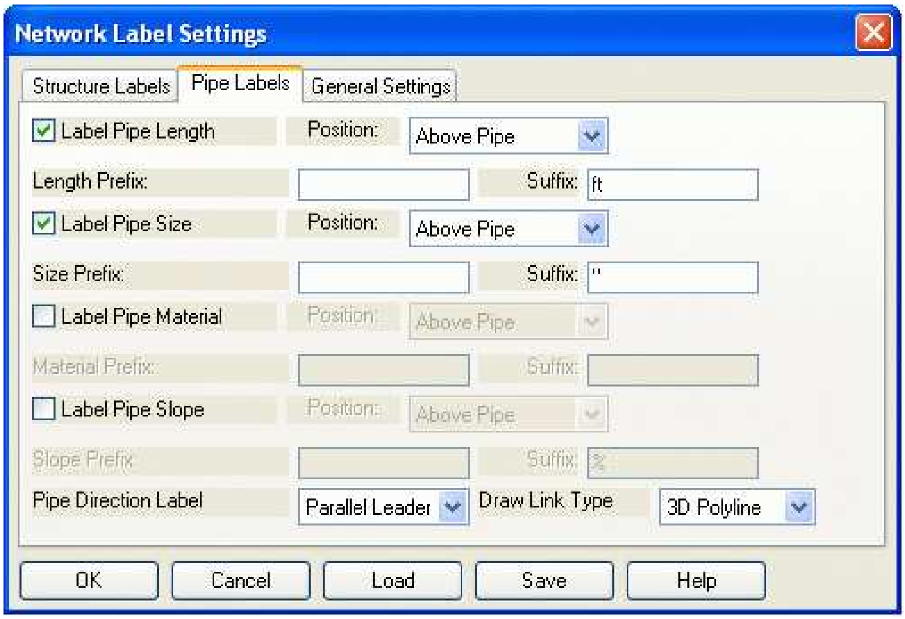
Plain View Label Settings

This command allows you to set the labeling for your structures and piping. The below dialog box gives you the option to display the Structure Name, the Rim Elevation, the Invert-In, and Invert-Out. In addition, you can set the Prefixes, Suffixes and labeling location as you so desire. The Use Structure Data Table will create linework around each Structure's labeling.


Network Label Settings
Structure Labels
Pipe Labels
General Settings
OK
Cancel
Load
Save
Help

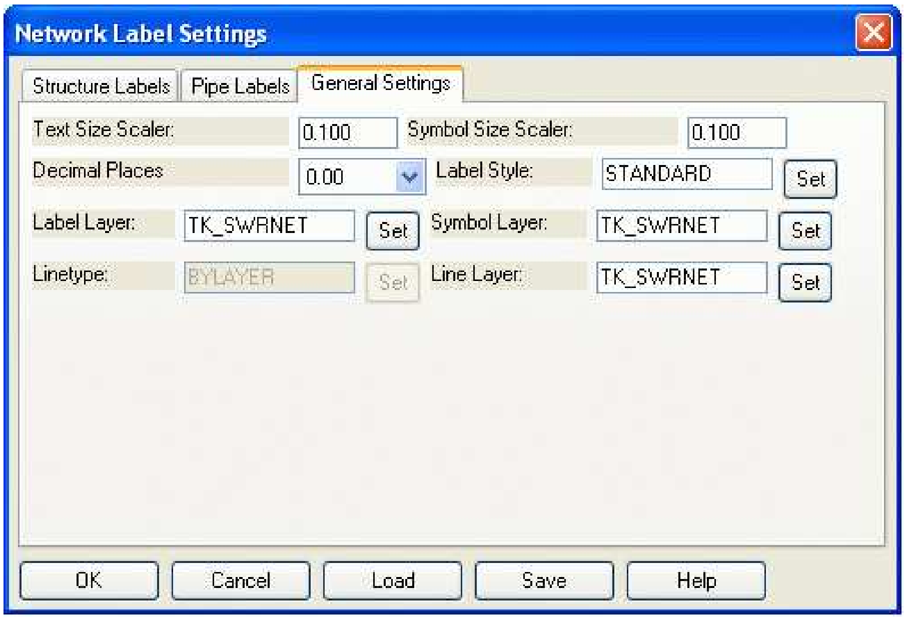
☑ Label Structure Name
Name Prefix: Suffix:
☐ Label Rim Elevation
Rim Prefix: RIM= Suffix:
☑ Label Invert-In Position: Above Structure ☐ Add Quadrant
Invert-In Prefix: IN= Suffix:
☑ Label Invert-Out Position: Above Structure ☐ Add Quadrant
Invert-Out Prefix: OUT= Suffix:
☐ Use Structure Data Table Justify: Left
Label Width: 7.00 Value Width: 8.00

This below dialog box gives you the option to display the Length, Size, Material, and Slope for you Piping. In addition, you can set the Prefixes, Suffixes and labeling location as you so desire. To specify to which structure the label is meant for, select Arrow On Pipe, Parallel Leader, or None. You can also set the type of linework to draw.


Network Label Settings
Structure Labels
Pipe Labels
General Settings
OK
Cancel
Load
Save
Help

☑ Label Pipe Length Position: Above Pipe
Length Prefix: Suffix: ft
☑ Label Pipe Size Position: Above Pipe
Size Prefix: Suffix: "
☐ Label Pipe Material Position: Above Pipe
Material Prefix: Suffix:
☐ Label Pipe Slope Position: Above Pipe
Slope Prefix: Suffix: %
Pipe Direction Label Parallel Leader Draw Link Type 3D Polyline

In this dialog you can set the properties for your Symbol and Linework as well as the decimal places to report.



Text Size Scaler: 0.100
Symbol Size Scaler: 0.100
Decimal Places 0.00
Label Style: STANDARD
Label Layer: TK_SWRNET
Symbol Layer: TK_SWRNET
Linetype: BYLAYER
Line Layer: TK_SWRNET

Prerequisite: a trench network
Keyboard Command: swrsetup

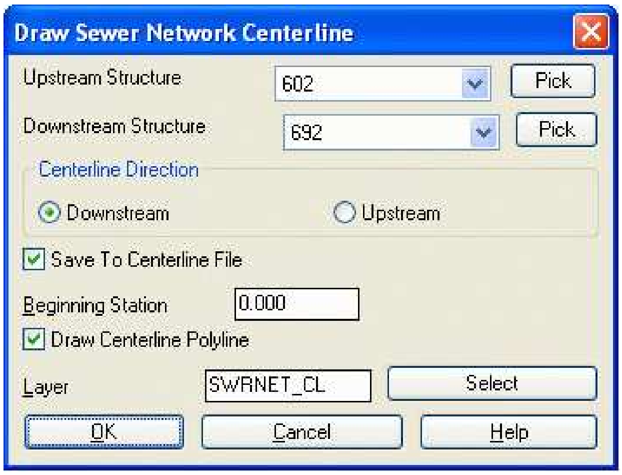
Draw Trench Network - Plan

This command draws a trench network structure on the screen, based on the Plan View Label Setting command and the trench network structure data in the .sew file whose name is as same as the drawing name. If Takeoff couldn't find such file in the same directory where the drawing locates, nothing would be drawn on the screen.

Prerequisite: A open drawing
Keyboard Command: plan_trench

Draw Trench Network Centerline

This command allows you to draw a branch of the trench network structure as a centerline. There has to be a trench network structure that has been created beforehand and its data is store in a .sew file whose name is as same as the drawing name, otherwise you would get a error message like "Error: no data in sewer network file". The command first prompts you the **Draw Sewer Network Centerline Dialog**. Select the Upstream and Downstream Structure for the centerline you are about to create. The Centerline Direction determines from which structure the polyline is drawn. You can also choose to save the centerline data to a .cl file with the option of entering in the Beginning Station. In this dialog is the ability to set the Layer name as well. Click OK to draw.


Draw Sewer Network Centerline

Upstream Structure: 602

Downstream Structure: 692

Centerline Direction: ● Downstream ○ Upstream

☑ Save To Centerline File

Beginning Station: 0.000

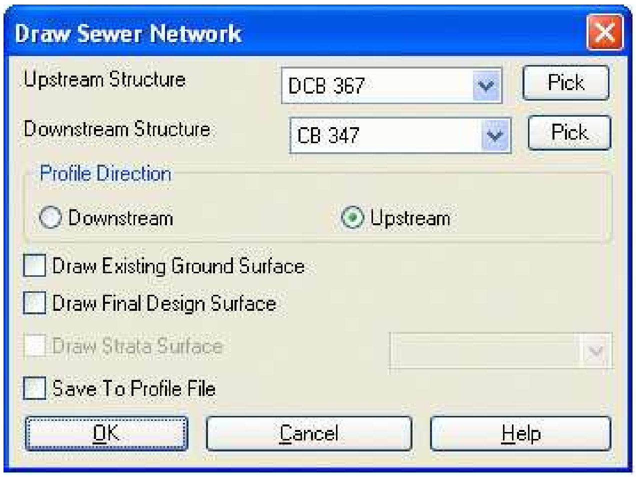
☑ Draw Centerline Polyline

Layer: SWRNET_CL

Prerequisite: Your drawing is open, has been cleaned up and pre-processed by such commands as Define Layer Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface. Trench structure data has been stored in a .sew file, whose name is as same as the drawing name.
Keyboard Command: drwswrcl

Draw Trench Network - Profile

This command allows you to draw a branch of the trench network structure as a sewer/pipe profile. There has to be a trench network structure that has been created beforehand and its data is store in a .sew file whose name is as same as the drawing name, otherwise you would get a error message like "Error: no data in sewer network file". The command first prompts you the Draw Sewer Network Dialog. Select the Upstream and Downstream Struct that you want to draw. If you want to draw the existing and final design surface, as well as Strata Surfaces, toggle on Draw Existing Ground Surface, Draw Final Design Surface, and Draw Strata Surfaces options. If your profile is from upstream to downstream, then select the Profile Direction as Downstream, otherwise Upstream. You can also choose to save the profile data to a profile file. Click OK to draw.


Draw Sewer Network

Upstream Structure: DCB 367

Downstream Structure: CB 347

Profile Direction: ○ Downstream ● Upstream

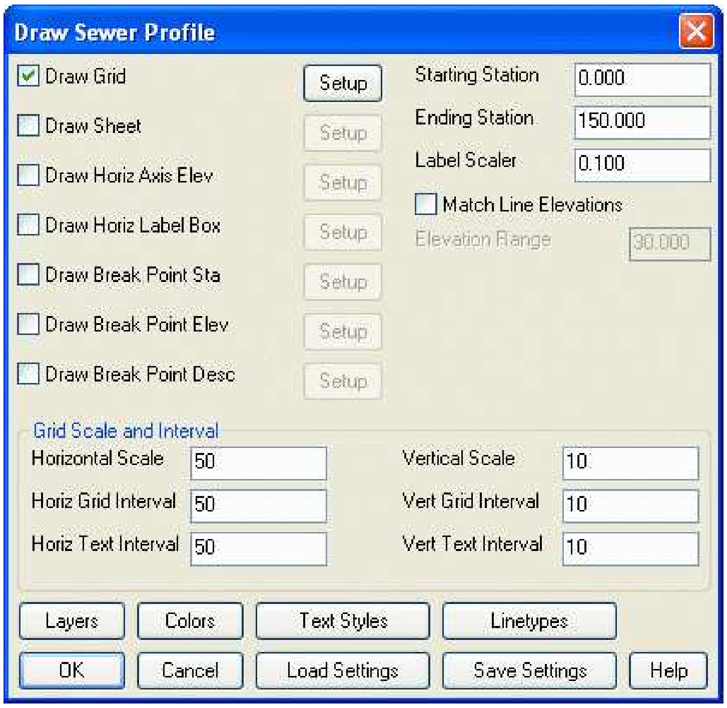
☐ Draw Existing Ground Surface

☐ Draw Final Design Surface

☐ Draw Strata Surface

☐ Save To Profile File

Initializing Draw Profile command ...
Draw Sewer Profile Dialog Enter drawing parameters such as Grid scale, text scaler, starting and ending stations etc. for drawing the sewer profile.



Draw Sewer Profile

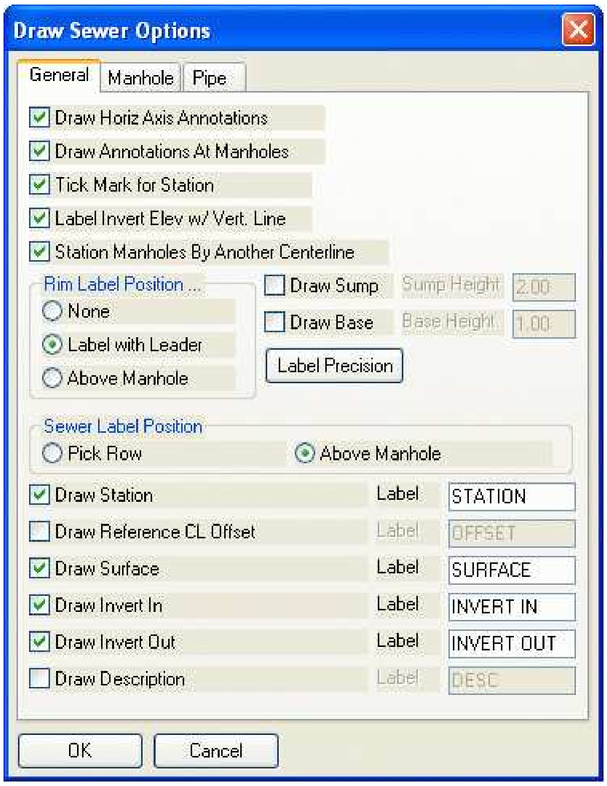
☑ Draw Grid
☐ Draw Sheet
☐ Draw Horiz Axis Elev
☐ Draw Horiz Label Box
☐ Draw Break Point Sta
☐ Draw Break Point Elev
☐ Draw Break Point Desc

Starting Station: 0.000
Ending Station: 150.000
Label Scaler: 0.100
☐ Match Line Elevations
Elevation Range: 30.000

Grid Scale and Interval
Horizontal Scale: 50
Horiz Grid Interval: 50
Horiz Text Interval: 50
Vertical Scale: 10
Vert Grid Interval: 10
Vert Text Interval: 10

Setup
Layers
Colors
Text Styles
Linetypes
OK
Cancel
Load Settings
Save Settings
Help

Enter general sewer profile settings such as elevations (Rim, Invert-In, Invert-Out) to draw and label.



Draw Sewer Options

General
Manhole
Pipe

☑ Draw Horiz Axis Annotations
☑ Draw Annotations At Manholes
☑ Tick Mark for Station
☑ Label Invert Elev w/ Vert. Line
☑ Station Manholes By Another Centerline

Rim Label Position ...
○ None
● Label with Leader
○ Above Manhole

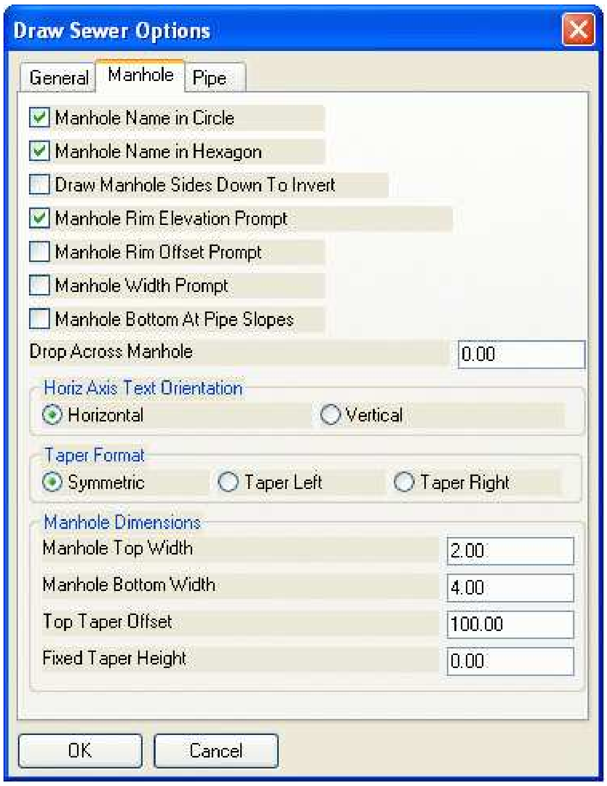
☐ Draw Sump — Sump Height: 2.00
☐ Draw Base — Base Height: 1.00

Sewer Label Position
○ Pick Row
● Above Manhole

☑ Draw Station — Label: STATION
☐ Draw Reference CL Offset — Label: OFFSET
☑ Draw Surface — Label: SURFACE
☑ Draw Invert In — Label: INVERT IN
☑ Draw Invert Out — Label: INVERT OUT
☐ Draw Description — Label: DESC

Label Precision
OK
Cancel

Use the Manhole tab to define what manhole information is labeled in your trench profile.



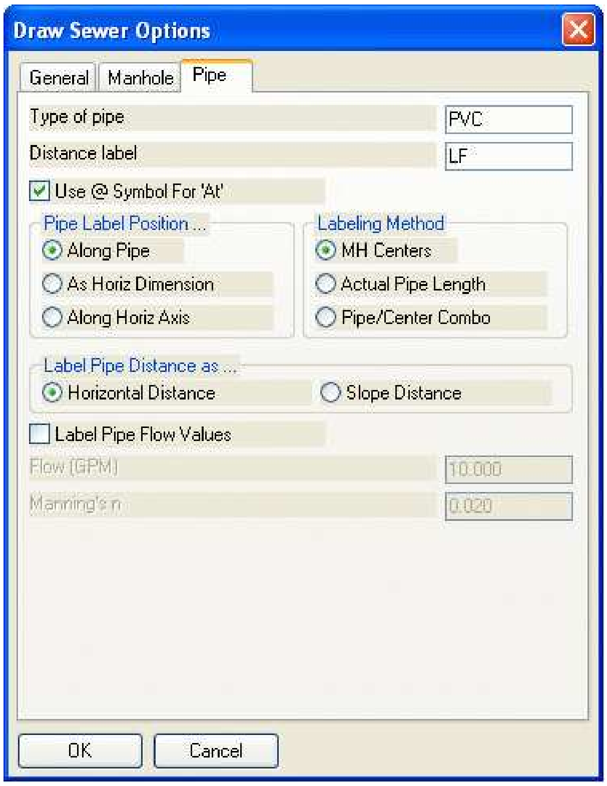
☑ Manhole Name in Circle
☑ Manhole Name in Hexagon
☐ Draw Manhole Sides Down To Invert
☑ Manhole Rim Elevation Prompt
☐ Manhole Rim Offset Prompt
☐ Manhole Width Prompt
☐ Manhole Bottom At Pipe Slopes
Drop Across Manhole 0.00

Horiz Axis Text Orientation
● Horizontal ○ Vertical

Taper Format
● Symmetric ○ Taper Left ○ Taper Right

Manhole Dimensions
Manhole Top Width 2.00
Manhole Bottom Width 4.00
Top Taper Offset 100.00
Fixed Taper Height 0.00

Use the Pipe tab to define what piping information is labeled in your trench profile.



Type of pipe PVC
Distance label LF
☑ Use @ Symbol For 'At'

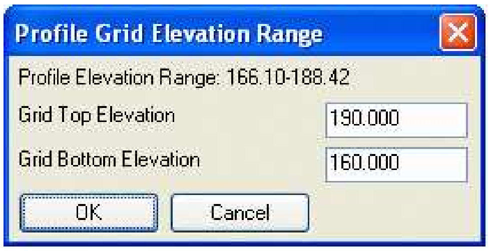
Pipe Label Position ...
● Along Pipe
○ As Horiz Dimension
○ Along Horiz Axis

Labeling Method
● MH Centers
○ Actual Pipe Length
○ Pipe/Center Combo

Label Pipe Distance as ...
● Horizontal Distance ○ Slope Distance

☐ Label Pipe Flow Values
Flow (GPM) 10.000
Manning's n 0.020

The command will find the elevation range of your profile and display it at the top of this dialog. Here you can set the elevation top and bottom of the profile's grid.



Profile Elevation Range: 166.10-188.42

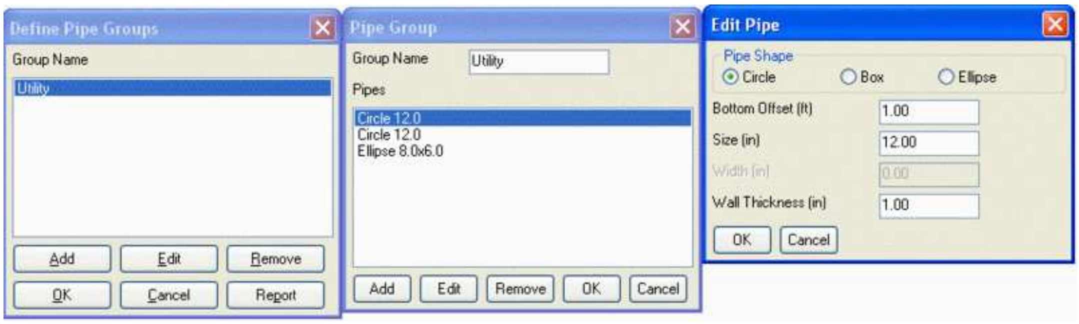
Grid Top Elevation: 190.000

Grid Bottom Elevation: 160.000

Prerequisite: Your drawing is open, has been cleaned up and pre-processed by such commands as Define Layer Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface. Trench structure data has been stored in a .sew file, whose name is as same as the drawing name.
Keyboard Command: profile_trench

Define Pipe Groups

Pipe Groups allow users to define multiple pipes inside a single trench. Pipe Groups can be applied to a Trench Run during the creation of a Trench Network or after the fact with Edit Trench Structure. In the Define Pipe Groups dialog you can Add, Remove, Edit, or Report different Pipe Groups.



Group Name: Utility

Group Name: Utility

Pipes:
Circle 12.0
Circle 12.0
Ellipse 8.0x6.0

Pipe Shape: ● Circle ○ Box ○ Ellipse

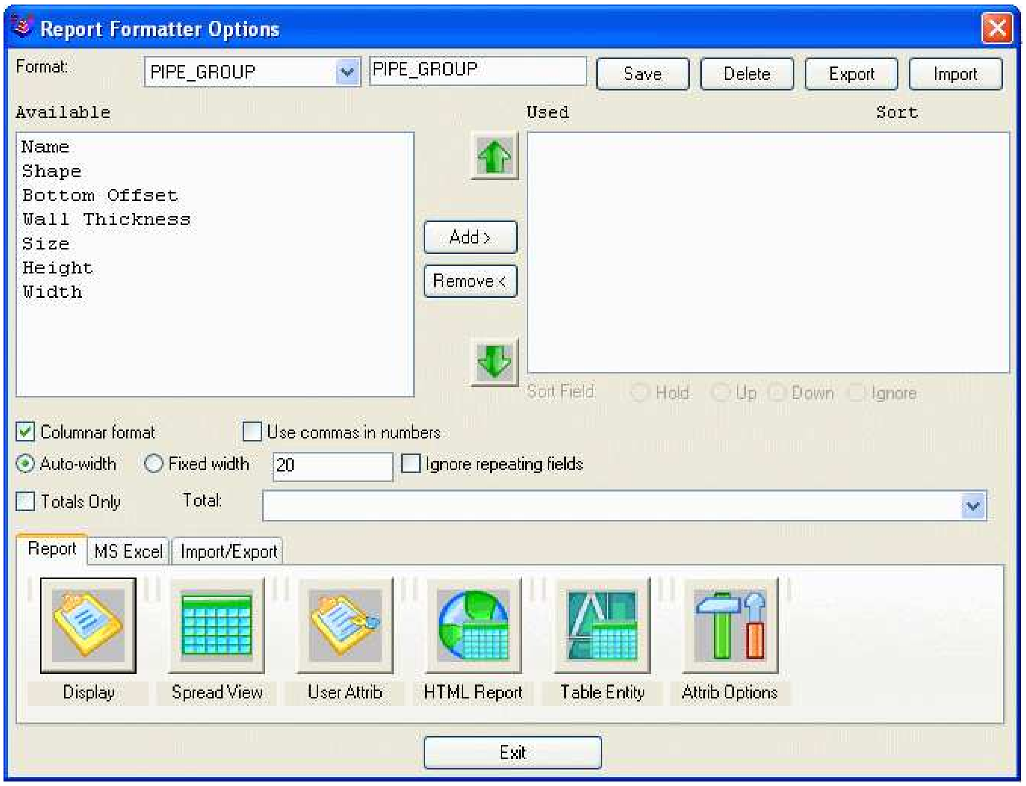
Bottom Offset (ft): 1.00

Size (in): 12.00

Width (in): 0.00

Wall Thickness (in): 1.00

Click Add and a blank Pipe Group dialog will appear. Here you can enter in a Name for the Group and Add different types of pipes into the Group. Clicking Edit or Add in the Point Group dialog will bring up the Edit Pipe dialog. Here you can specify the Pipe Shape, Bottom Offset (from the bottom of the Trench), the Size, Width (when needed), and the Wall Thickness of the pipe.
Report in the Define Pipe Groups dialog will bring up the below dialog:


Report Formatter Options

Format: PIPE_GROUP PIPE_GROUP

Available
Name
Shape
Bottom Offset
Wall Thickness
Size
Height
Width

Used

Sort

Sort Field: ○ Hold ○ Up ○ Down ○ Ignore

☑ Columnar format ☐ Use commas in numbers
● Auto-width ○ Fixed width 20 ☐ Ignore repeating fields
☐ Totals Only Total:

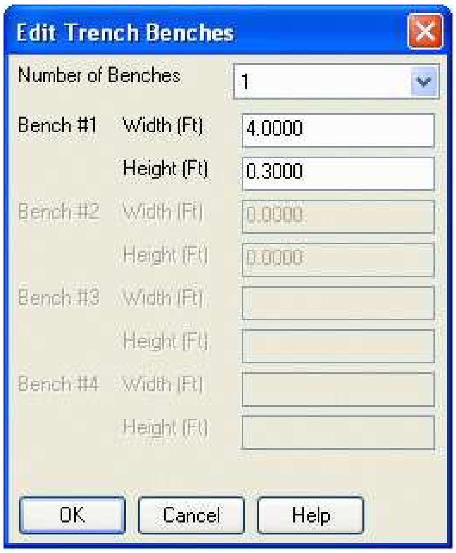
Save
Delete
Export
Import
Add >
Remove <
Report
MS Excel
Import/Export
Display
Spread View
User Attrib
HTML Report
Table Entity
Attrib Options
Exit

From this dialog you can pick on what you want to report and view it or export it into Excel.

Prerequisite: none
Keyboard Command: define_pipe_grp

Input-Edit Trench Template

This command lets you create a new trench template or modify an existing trench template. It prompts you the **Input-Edit Trench Template Dialog**. If you are modifying a trench template, click the **Load** button on the dialog to open a trench template file and display the template data on the dialog. Enter the dimensions of the trench: bottom offset, trench width and vertical side height. The Edit Trench Benches button will bring up the below dialog, and allows you to enter in up to four benches into your trench.



Edit Trench Benches

Number of Benches: 1

Bench #1 Width (Ft): 4.0000

Height (Ft): 0.3000

Bench #2 Width (Ft): 0.0000

Height (Ft): 0.0000

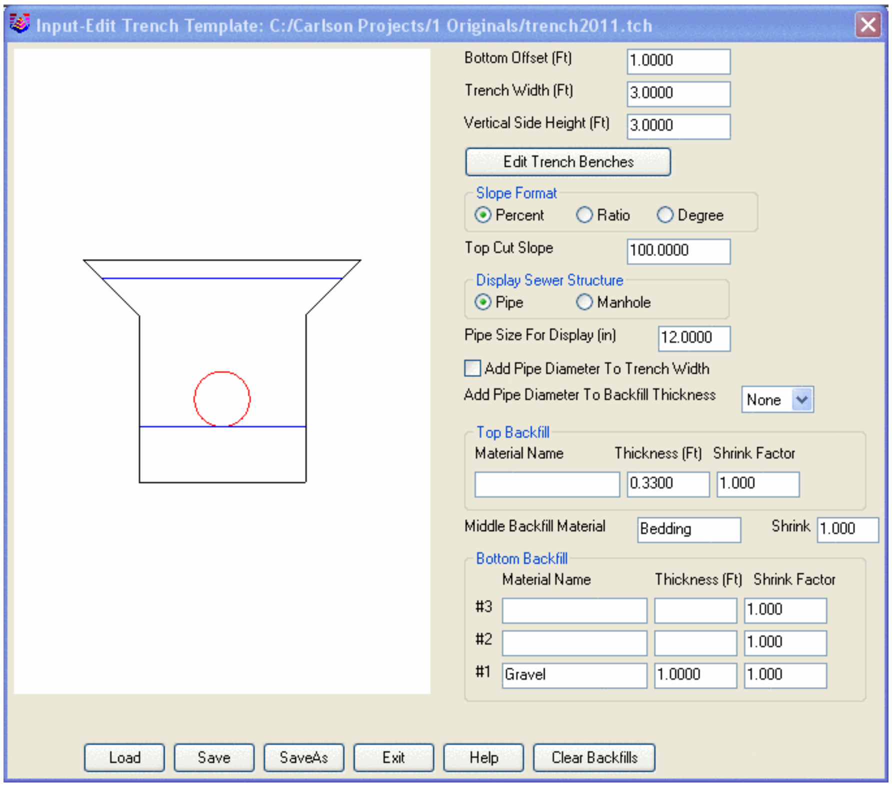
Bench #3 Width (Ft):

Height (Ft):

Bench #4 Width (Ft):

Height (Ft):

There are three methods for entering the cut slope, Percent, Ratio and Degree. Choose one of the methods and enter the slope value. Display Sewer Structure allows you to see your pipe or manhole as part of the trench. This is for display purposes only, calculations will be drawn from the pipe size you set in the Trench Network Structure commands. Add Pipe Diameter To Trench Width will increase the size of your trench by the diameter of your different pipe sizes.



Input-Edit Trench Template: C:/Carlson Projects/1 Originals/trench2011.tch

Bottom Offset (Ft): 1.0000

Trench Width (Ft): 3.0000

Vertical Side Height (Ft): 3.0000

Slope Format: ● Percent ○ Ratio ○ Degree

Top Cut Slope: 100.0000

Display Sewer Structure: ● Pipe ○ Manhole

Pipe Size For Display (in): 12.0000

☐ Add Pipe Diameter To Trench Width

Add Pipe Diameter To Backfill Thickness: None

Top Backfill

Material Name	Thickness (Ft)	Shrink Factor
	0.3300	1.000

Middle Backfill Material: Bedding Shrink: 1.000

Bottom Backfill

	Material Name	Thickness (Ft)	Shrink Factor
#3			1.000
#2			1.000
#1	Gravel	1.0000	1.000

If there is a Top Backfill, enter the Material Name, Thickness and if needed Shrink Factor. The thickness of the Top Backfill is assessed from the top of the trench down. There are three trench Bottom Backfill layers that can be defined. Enter the layer label in the material name field, the depth of the layer in the thickness field. The thickness of these values are assessed from the bottom of the trench up. The Middle Backfill Material is any volume between the Top and Bottom Backfills and can fluxuate depending on the depth of the trench. No set thickness can be applied to the Middle Backfill. Click Save or SaveAs to save the template information in a .tch file, and Click Exit to quit this command.

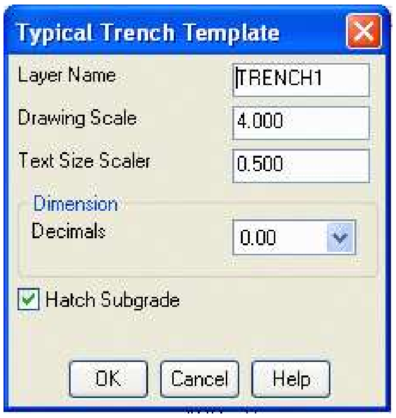
Prompts:

Input-Edit Trench Template Dialog
Enter the dimensions of the trench template, save the information to a template file (.tch).

Prerequisite: None
Keyboard Command: make_trench_tpl

Draw Typical Trench Template

This command draws a trench template on the screen. After you select a trench template file (.tch) to draw, a **Typical Trench Template Dialog** is prompted for entering the layer name, drawing scale, text size scaler and selecting how many decimal points you want. You can also hatch the backfill on the drawing. Click OK to draw the template at the position that you pick on the screen.



Layer Name: TRENCH1
Drawing Scale: 4.000
Text Size Scaler: 0.500
Dimension
Decimals: 0.00
☑ Hatch Subgrade

Prompts

Pick position to draw template: *pick a position on the screen*

Prerequisite: None.
Keyboard Command: draw_trench_tpl

Trench Subgrade Areas

The purposes of Trench Subgrades is to assign a different type of trench template when a trench passes under a road, building pad, etc.

Set Trench Subgrade Polylines

Choose a closed polyline that defines the area that you want a different trench template for, ie a building pad polyline.

Prerequisite: None.
Keyboard Command: tag_trench_subgrade

Clear Trench Subgrade Polylines

This command untags selected polylines for trench subgrade use.

Prerequisite: Trench Subgrade Polylines
Keyboard Command: untag_trench_subgrade

Hatch Trench Subgrade Area

This command hatches trench subgrades for easy viewing.

Prerequisite: Trench Subgrade Polylines
Keyboard Command: hatch_trench_subgrade

Erase Trench Subgrade Hatch

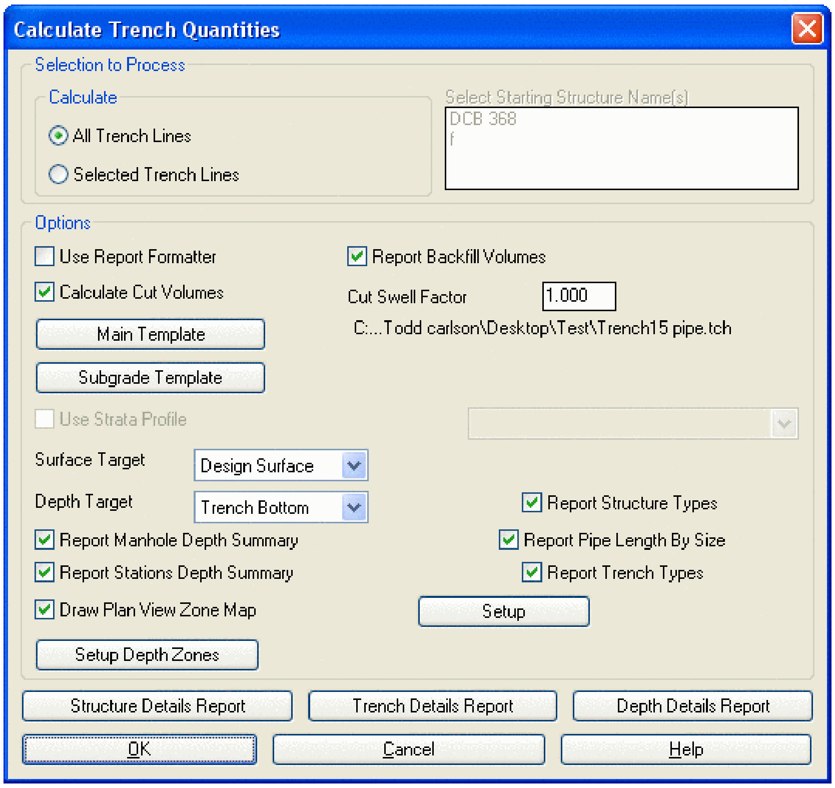
This removes previous made trench hatching.

Prerequisite: Trench Subgrade Hatching
Keyboard Command: erase_trench_subgrade

Trench Network Quantities

This command calculates the trench volumes. There has to be a trench network structure that has been created beforehand and its data is store in a .sew file whose name is as same as the drawing name, otherwise you would get a error message like "Error: no data in sewer network file".

The command loads the trench network data and splits them into individual trench lines and displays them on the **Calculate Trench Quantities Dialog**. You can choose to calculate the trench volume of one trench line or several trench lines at a time. You need to set a **Main Template** in order to calculate volumes. To create a template, run Trench> **Input-Edit Trench Template**. The trench cut volume is multiplied by the Cut Swell Factor. Surface Target determines the Surface that the bottom of the trench is compared to, either: the Existing Surface, the Design, the Existing and Design to minimize cut, or simply to the Rim Elevations (no surface required). Trench Depths can be reported by either the bottom of the trench or bottom of the pipe by using the Depth Target pull-down. If you have Strata Surfaces defined then the program can calculate cut volumes for a strata you select. For more comprehensive reports you can customize, click on the Structure, Trench, and Depth Details Reports buttons. For the Standard Report, click the OK button.



Calculate Trench Quantities

Selection to Process

Calculate

- ● All Trench Lines
- ○ Selected Trench Lines

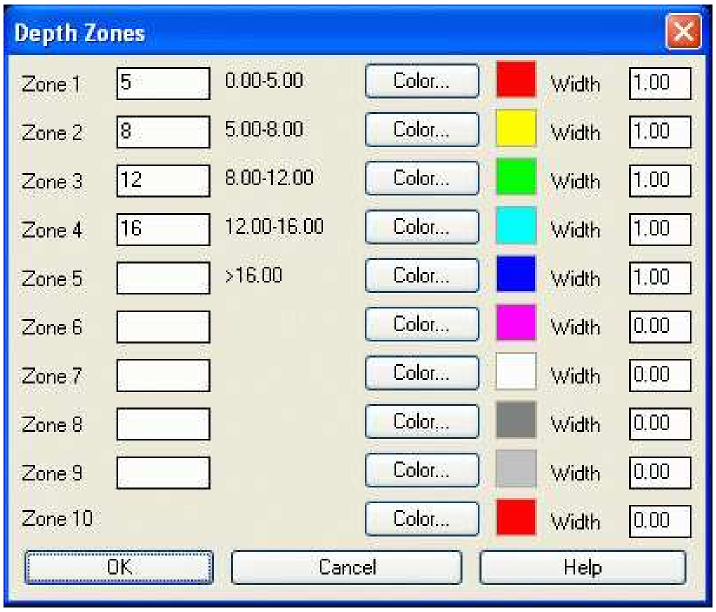
Select Starting Structure Name(s): DCB 368

Options

- ☐ Use Report Formatter
- ☑ Report Backfill Volumes
- ☑ Calculate Cut Volumes
- Cut Swell Factor: 1.000
- C:...Todd carlson\Desktop\Test\Trench15 pipe.tch
- ☐ Use Strata Profile
- Surface Target: Design Surface
- Depth Target: Trench Bottom
- ☑ Report Structure Types
- ☑ Report Manhole Depth Summary
- ☑ Report Pipe Length By Size
- ☑ Report Stations Depth Summary
- ☑ Report Trench Types
- ☑ Draw Plan View Zone Map

Main Template
Subgrade Template
Setup
Setup Depth Zones
Structure Details Report
Trench Details Report
Depth Details Report
OK
Cancel
Help

Setup Depth Zones will report you your Trench depth zones by stations along the trench network. You can also color the trench in the drawing by defined zones. Click OK to compute the template volumes. Backfill quantities take into account pipe size. A report would be shown after the calculation.



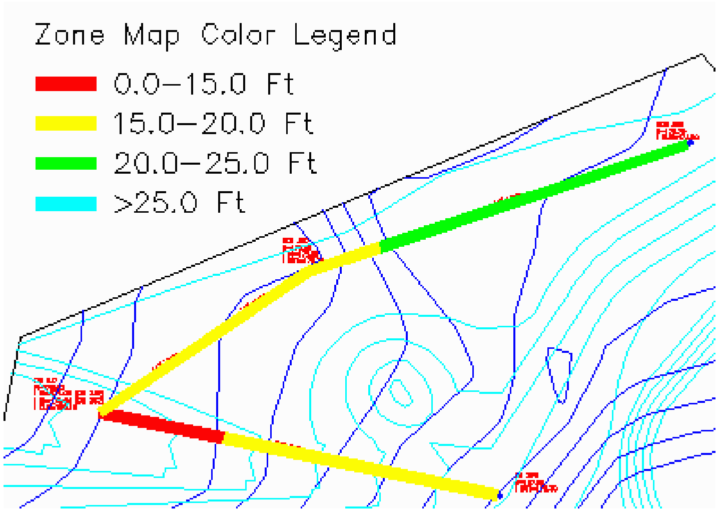
Depth Zones

Zone 1	5	0.00-5.00	Color...	🟥	Width	1.00
Zone 2	8	5.00-8.00	Color...	🟨	Width	1.00
Zone 3	12	8.00-12.00	Color...	🟩	Width	1.00
Zone 4	16	12.00-16.00	Color...	🟦	Width	1.00
Zone 5		>16.00	Color...	🟦	Width	1.00
Zone 6			Color...	🟪	Width	0.00
Zone 7			Color...	⬜	Width	0.00
Zone 8			Color...	⬛	Width	0.00
Zone 9			Color...	⬜	Width	0.00
Zone 10			Color...	🟥	Width	0.00

OK
Cancel
Help

Prompts

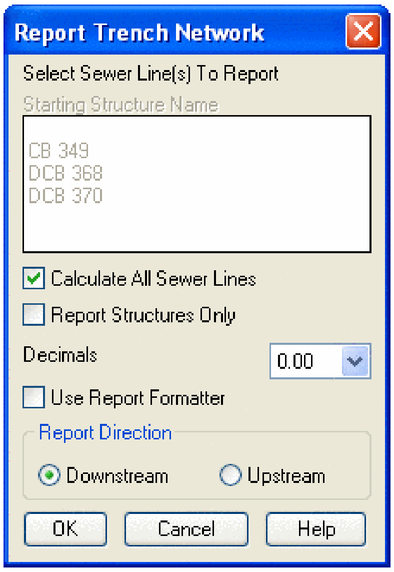
Trench Quantities Report Window
Draw zone map color legend on the screen [Yes/<No>]: *y for Yes*
Pick a point for color legend: *pick a point away from site*
Legend size <10.00>: *Press <Enter> for the default*



Prerequisite: Your drawing is open, has been cleaned up and pre-processed by such commands as Define Layer Target, Set Boundary Polyline, Make Existing Ground Surface and Make Design Surface. Trench structure data has been stored in a .sew file, whose name is as same as the drawing name.
Keyboard Command: calc_trench

Report Trench Network

This command will a report the Name, Station Distance, Invert-In Slope, Invert-Out Width, the Rim Elevation, Trench Type, Manhole Depth, and the Area Direction for the selected Trench. You may also choose to report the Trench Network from Downstream or Upstream, or just the Structures.



Report Trench Network

Select Sewer Line(s) To Report

Starting Structure Name

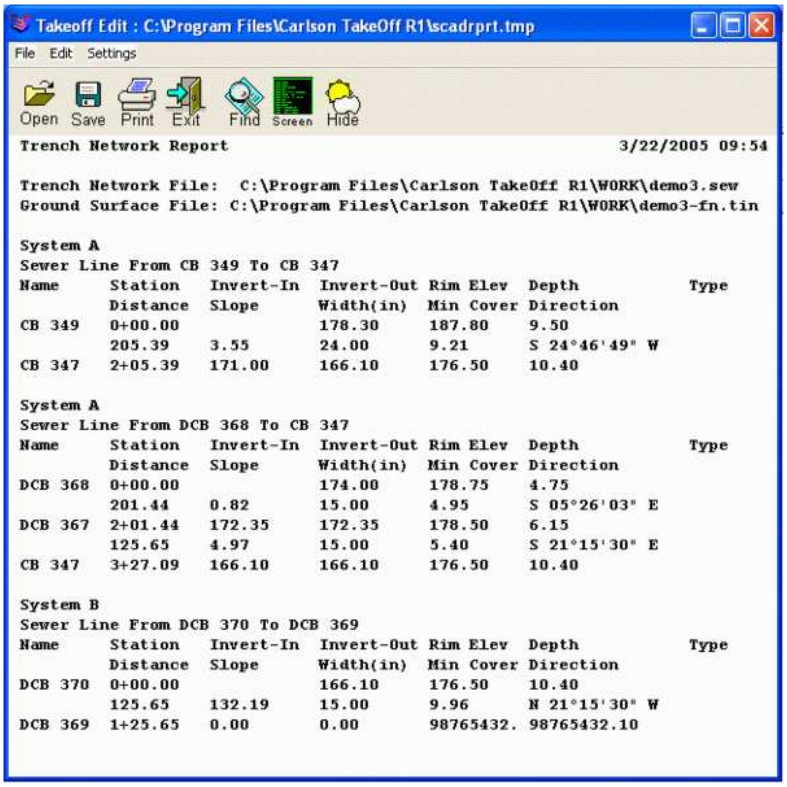
CB 349
DCB 368
DCB 370

☑ Calculate All Sewer Lines
☐ Report Structures Only

Decimals 0.00

☐ Use Report Formatter

Report Direction
● Downstream ○ Upstream


Takeoff Edit : C:\Program Files\Carlson TakeOff R1\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Trench Network Report                                          3/22/2005 09:54

Trench Network File:  C:\Program Files\Carlson TakeOff R1\WORK\demo3.sew
Ground Surface File: C:\Program Files\Carlson TakeOff R1\WORK\demo3-fn.tin

System A
Sewer Line From CB 349 To CB 347
Name      Station   Invert-In  Invert-Out Rim Elev  Depth           Type
          Distance  Slope      Width(in)  Min Cover Direction
CB 349    0+00.00              178.30     187.80    9.50
          205.39    3.55       24.00      9.21      S 24°46'49" W
CB 347    2+05.39   171.00     166.10     176.50    10.40

System A
Sewer Line From DCB 368 To CB 347
Name      Station   Invert-In  Invert-Out Rim Elev  Depth           Type
          Distance  Slope      Width(in)  Min Cover Direction
DCB 368   0+00.00              174.00     178.75    4.75
          201.44    0.82       15.00      4.95      S 05°26'03" E
DCB 367   2+01.44   172.35     172.35     178.50    6.15
          125.65    4.97       15.00      5.40      S 21°15'30" E
CB 347    3+27.09   166.10     166.10     176.50    10.40

System B
Sewer Line From DCB 370 To DCB 369
Name      Station   Invert-In  Invert-Out Rim Elev  Depth           Type
          Distance  Slope      Width(in)  Min Cover Direction
DCB 370   0+00.00              166.10     176.50    10.40
          125.65    132.19     15.00      9.96      N 21°15'30" W
DCB 369   1+25.65   0.00       0.00       98765432. 98765432.10
```

Prerequisite: a sewer line
Keyboard Command: reportswr

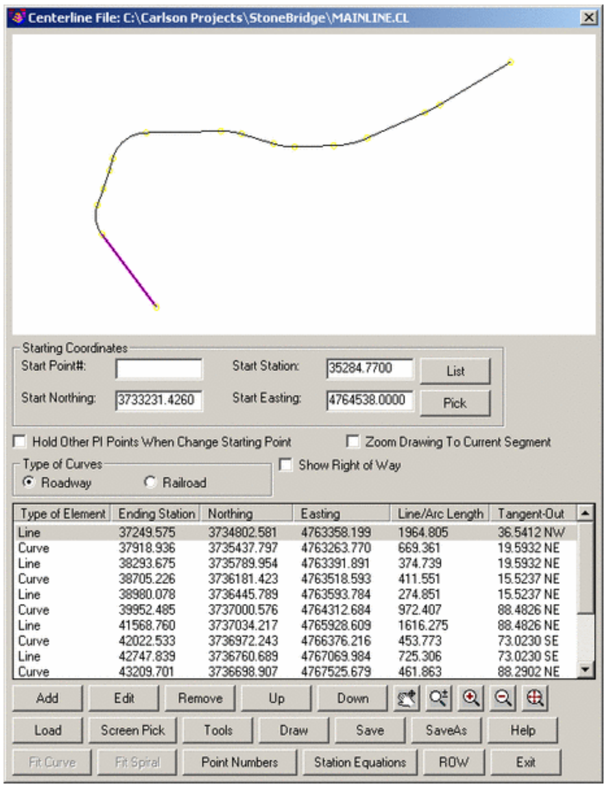
Roads Menu

12

Input-Edit Centerline File

This command can be used to input a new centerline or edit an existing centerline (.CL) file. It is a dialog-based alternative to Design Centerline and has the advantage of accepting whatever information you have on your centerlines (coordinates, stationing, length of tangents and arcs, *etc*). For creating a new centerline, it is ideal for entering data straight from highway design plans. For editing, this command allows you to change any of the geometric properties of any of the elements of the centerline (lines, curves, spiral-only and symmetrical spiral-curve-spiral elements), including the starting coordinates and station.

Starting this command launches the Centerline Input-Edit main dialog box. To edit an existing Centerline, you can either pick the Load button and pick the .CL file, or pick the Screen Pick button and pick the polyline in the drawing that represents the Centerline. The Centerline is then displayed in the graphics window of the dialog box. The highlighted segment in the text window is also highlighted in the graphics window.



Centerline File: C:\Carlson Projects\StoneBridge\MAINLINE.CL

Starting Coordinates

Start Point#:

Start Station: 35284.7700

Start Northing: 3733231.4260

Start Easting: 4764538.0000

☐ Hold Other PI Points When Change Starting Point

☐ Zoom Drawing To Current Segment

Type of Curves: ● Roadway ○ Railroad

☐ Show Right of Way

Type of Element	Ending Station	Northing	Easting	Line/Arc Length	Tangent-Out
Line	37249.575	3734802.581	4763358.199	1964.805	36.5412 NW
Curve	37918.936	3735437.797	4763263.770	669.361	19.5932 NE
Line	38293.675	3735789.954	4763391.891	374.739	19.5932 NE
Curve	38705.226	3736181.423	4763518.593	411.551	15.5237 NE
Line	38980.078	3736445.789	4763593.784	274.851	15.5237 NE
Curve	39952.485	3737000.576	4764312.684	972.407	88.4826 NE
Line	41568.760	3737034.217	4765928.609	1616.275	88.4826 NE
Curve	42022.533	3736972.243	4766376.216	453.773	73.0230 SE
Line	42747.839	3736760.689	4767069.984	725.306	73.0230 SE
Curve	43209.701	3736698.907	4767525.679	461.863	88.2902 NE

Drag Action (Zoom and Pan): In the graphics window, hold the left mouse button down and move mouse to Pan, roll the wheel to Zoom.

Zoom Drawing To Current Segment: This option zooms the drawing graphics to center on the centerline segment currently highlighted in the dialog.

Hold Other PI Points When Change Starting Point: With this option active, all the existing PI's are held when the starting coordinate is moved. Otherwise, all the PI's are moved by the same amount that the starting point is moved.

Show Right of Way: This option shows any ROW's defined in the centerline in the graphic preview window.

Type of Curves: This setting chooses between roadway and railroad definitions for curve lengths.

Add: Adds a new element after the highlighted element. Prompts you for the type of the element to be added, Line, Curve, Spiral-Only or Spiral-Curve-Spiral.

Edit: Allows you to edit the highlighted segment.

Remove: Removes the highlighted element from the centerline.

Up/Down: Moves elements in the table Up and Down in the list. For example, if this centerline ended with a tangential line from the last curve, then was followed by a non-tangential line at 45d NE, moving the last element up would create a line at 45d after the curve (non-tangential), and the formerly tangential line will remain tangential and therefore continue at NE 45d.

Load: Loads an existing centerline (.CL) file for review or editing. After loading a centerline, the listbox in the dialog shows a list of all the elements in the centerline, identifying them as either a line, curve, spiral only or full spiral-curve-spiral element and reporting the ending station, northing and easting of the element.

Screen Pick: Allows user to pick a CL off the screen in the drawing to load into the editor.

Tools > **Reverse:** Reverses direction of Centerline.

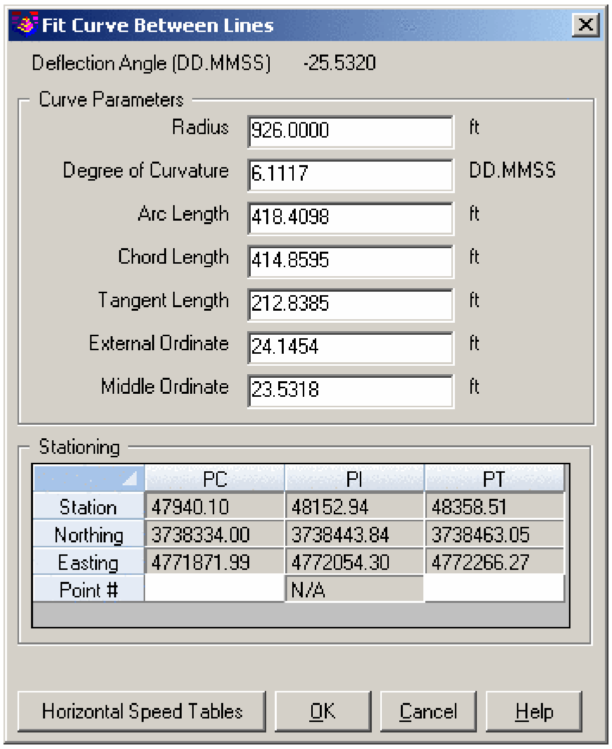
Tools > **Rotate:** Rotates the centerline by the specified rotation angle and around the specified pivot point.

Draw: This button draws the centerline in the drawing on the specified layer.

Save: Saves the currently loaded centerline to a file, or will prompt you for a name if no name has been set.

SaveAs: Prompts you for a file name for the saved file.

Fit Curve: Fits a circular curve element into the centerline after the line element that is currently selected.



Deflection Angle (DD.MMSS) -25.5320

Radius 926.0000 ft

Degree of Curvature 6.1117 DD.MMSS

Arc Length 418.4098 ft

Chord Length 414.8595 ft

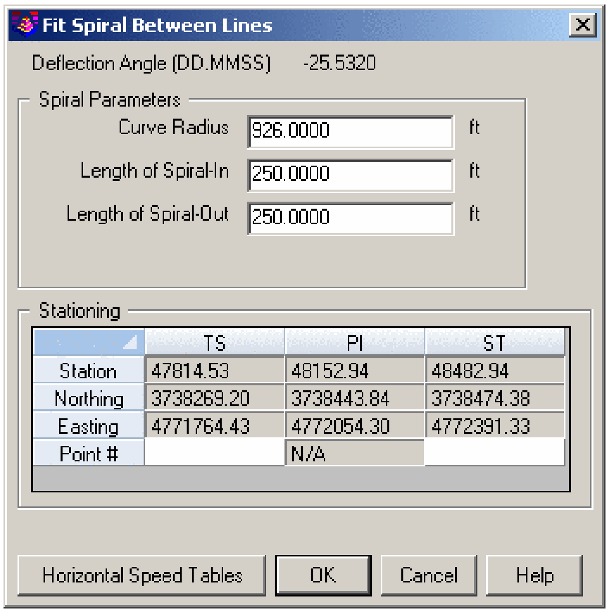
Tangent Length 212.8385 ft

External Ordinate 24.1454 ft

Middle Ordinate 23.5318 ft

	PC	PI	PT
Station	47940.10	48152.94	48358.51
Northing	3738334.00	3738443.84	3738463.05
Easting	4771871.99	4772054.30	4772266.27
Point #		N/A	

Fit Spiral: Fits a spiral curve element into the centerline after the line element that is currently selected.



Deflection Angle (DD.MMSS) -25.5320

Curve Radius 926.0000 ft

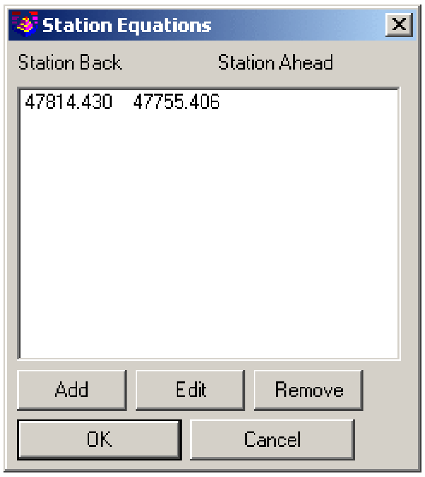
Length of Spiral-In 250.0000 ft

Length of Spiral-Out 250.0000 ft

	TS	PI	ST
Station	47814.53	48152.94	48482.94
Northing	3738269.20	3738443.84	3738474.38
Easting	4771764.43	4772054.30	4772391.33
Point #		N/A	

Point Numbers: This will create Carlson points along the elements of the centerline and store them to the current CRD file. The new points will be numbered in sequence beginning with the first available point number in the CRD file.

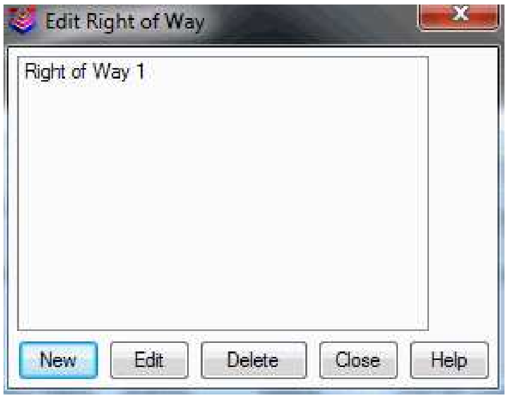
Station Equations: At any number of locations on a centerline, you can set the back station and forward station for the re-stationing of the centerline. The station equation dialog appears below:



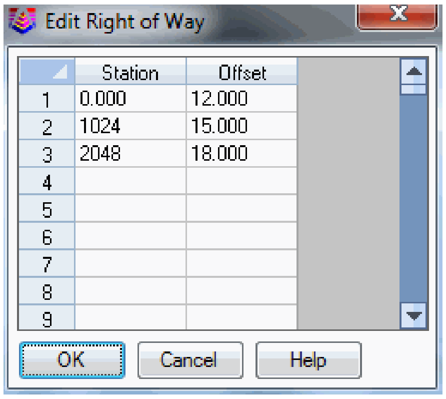
Station Back	Station Ahead
47814.430	47755.406

If the Station Back is lower than the Station Ahead, then a "gap" is inserted in the centerline, where the stations jump forward. If the Station Ahead is less than the Station Back, then an overlap occurs, where the common station range is repeated.

ROW: This function edits the right-of-way definitions associated with the centerline. There can be multiple ROW's assigned to the centerline for left and right sides as well as multiple on the same side. The function first shows a list of ROW's for the centerline where you can add, edit or delete.



When you add or edit a ROW, there is a second dialog for entering the stations and offsets that define the ROW relative to the centerline. Use negative offsets for left and positive for right.



	Station	Offset
1	0.000	12.000
2	1024	15.000
3	2048	18.000
4		
5		
6		
7		
8		
9		

Alternatively, the **Enter Right of Way** and **Polyline to Right of Way** commands are other ways to define the ROW's for a centerline.

Exit: Exits this routine, prompting to save changes if necessary.

The dialog for every type of element shows the point ID, the northing, easting and station of the start point of the element. It then allows the user to modify or define the parameters specific to the type of element. The following are some of the things to remember about data entry in the centerline editor. These are valid for lines, curves and spirals.

- Wherever length of the element is to be entered, entering an expression of the type 123.5 - 93.7 would evaluate the difference of the values. This is particularly convenient where only the stations of the start and end points of the element are known.
- When the station is specified, the program takes the length of the element as the difference between the station of the start point of the element and the station specified.
- All bearings should be specified by entering the angle between 0 and 90 degrees (in dd.mmss format) and selecting the quadrant.
- When entering the delta angle of a curve, only the absolute value (between 0 and 360 degrees) is to be entered. The direction of the curve is to be explicitly set as right or left, the default being left. All angles are entered in (dd.mmss) format.
- Point numbers, when used, access their coordinates in the current .CRD file. If the point number specified has no coordinates stored in the coordinate file, the point number is remembered for that particular location (say the radius point of a curve or the SC point of a spiral). Then, when the .CL file is saved, the program creates points for that location and stores them to the .CRD file with the specified point number.

The dialog for a Line allows the user to specify the line primarily by its length or station and its bearing. The line can also be defined by its end point number or its coordinates. The bearing of a line can be changed if the Tangential to the Previous Element toggle is not checked. By default, any line which follows a curve element is defaulted to be tangential to it. To use a bearing different than that of the previous element, uncheck this toggle and enter the bearing.

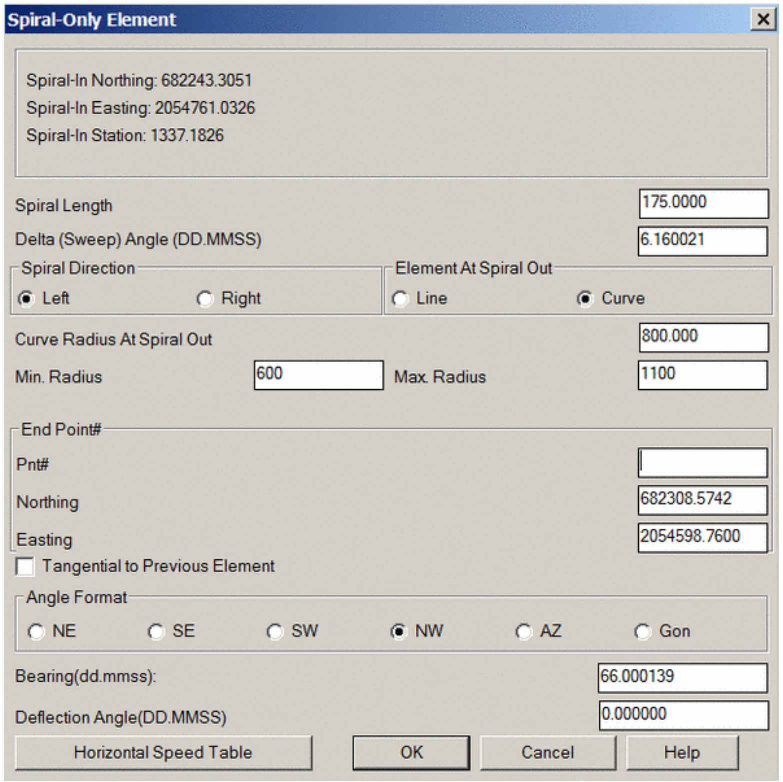
The dialog for the Curve allows the user to define the curve primarily by its radius and delta angle or arc length. The other parameters of the curve that can be edited are the bearing of tangent-out and the "Station to", which also defines the arc length. The curve can also be specified by entering the coordinates or point numbers of its end point (PT) and the radius point. Another way to specify the curve would be to enter the chord length or PT point station and chord bearing. If the central PI point and a point on the forward tangent are known, then the curve can be defined by entering both of these points and at least one other property of the curve (like radius, arc length, delta angle). The point on the forward tangent can be any point that defines the tangent out direction including the next PI point. If only the central PI point is known, then the tangent-out can be entered by bearing instead of by forward tangent point. Central PI and forward tangent points are not displayed from the .CL file. They have to be entered by the user and are valid only for that particular edit session; that is, they are not remembered the next time the file is loaded. Curves are assumed to be tangent to the last element unless the Tangential to the Previous Element checkbox is cleared.

The Curve Edit Mode option defines how the curve is accepted in the centerline. If the Hold PC point is checked on, the radius is taken as fixed and the delta angle of the curve is calculated based on some additional parameter. Hence, the extent of the curve is unlimited. However, if the Hold PI points option is checked on, the bearing of tangent-out of the curve is taken as fixed and the radius is calculated based on some other parameter. In this case, the curve is completely restricted within the central PI point and the bearing of tangent out. Hence, when the Hold PI points option is checked on, the above parameters should also be defined to carry out the calculations.

The dialog for the Spiral-Curve-Spiral element allows the user to define the spiral by entering either the various parameters of the spiral (like the angles and lengths) or the coordinates or point numbers of its defining points: the TS (Tangent-to-Spiral), SC (Spiral-to-Curve), Radius point, CS (Curve-to-Spiral), ST (Spiral-to-Tangent) and end point (optional). While defining the spiral by its geometric properties, the program will accept the data even if the information for the simple curve is given with zero spiral lengths. In this method, however, the central PI point of the spiral MUST be specified (that is, it is always in Hold PI Points mode). The tangent out can be defined by entering bearing or by specifying a point on the forward tangent. This forward tangent point can be the next PI coordinates. The direction of the spiral-in and spiral-out elements would be the same as the direction of the simple curve (left or right). The Spiral Definition setting chooses between Arc definition for clothoid spirals and Chord for 10-chord spirals.

The spiral can be defined by several different parameters and the order that you enter data into the spiral dialog can be important. There are two main sequences for entering data. The method to use depends on the spiral data that you have. The first method is to enter the radius of the simple curve, the spiral in and out lengths, the tangent bearing out and the PI station. The second method is to make a Line segment coming up to the TS (tangent to spiral) point. This Line segment should be added before creating the Spiral element. Then with the Spiral In point set to the TS point, enter the radius of the simple curve, the spiral in and out lengths, the curve direction (left or right) and the arc length of the simple curve. Then the rest of the spiral points will be calculated.

The Spiral Only element allows for flexible transitions from curve to spiral to curve or line to spiral to curve or between any combination of curve and line elements. The Spiral-Curve-Spiral element, for example, can be entered as Line, Spiral Only, Curve, Spiral Only and Line, producing the same results. You can spiral from tangent to curve, curve to tangent and curve of one radius to curve of another radius. You can also spiral from one endpoint to another endpoint. To define the spiral by sweep angle, use the Delta Angle field. To define the spiral by length, use the Spiral Length field. To define the spiral by end point, fill in the min and max radius fields and then enter either the End Point Pnt# or coordinates and the program will calculate the radius and spiral length to fit that point.

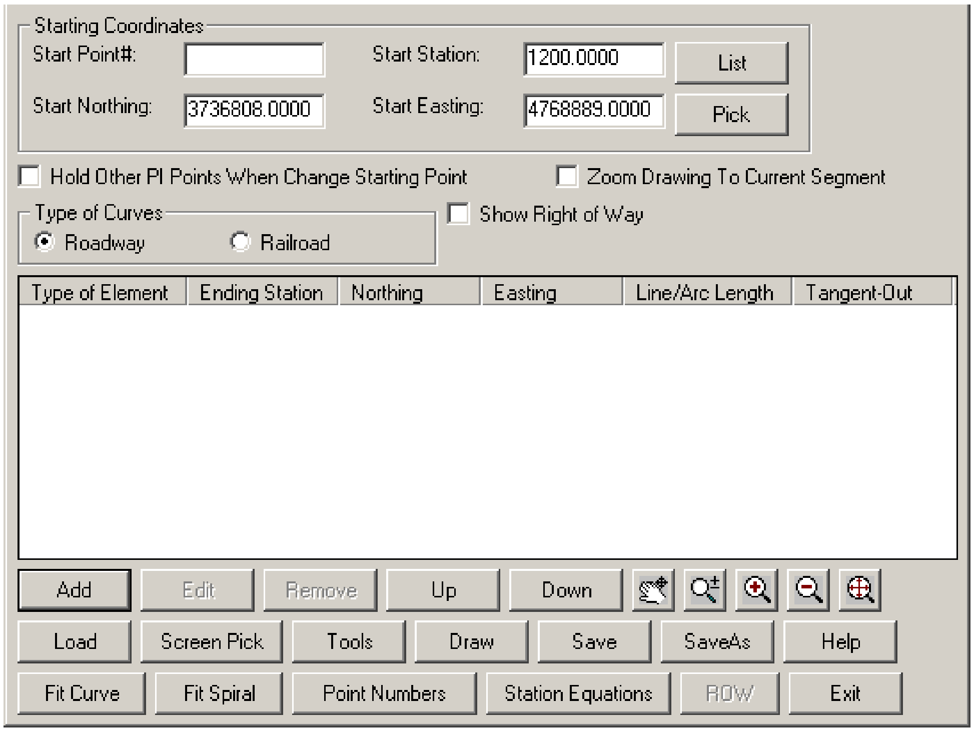

Spiral-Only Element
Horizontal Speed Table
OK
Cancel
Help

Spiral-In Northing: 682243.3051
Spiral-In Easting: 2054761.0326
Spiral-In Station: 1337.1826

Spiral Length: 175.0000
Delta (Sweep) Angle (DD.MMSS): 6.160021
Spiral Direction: ● Left ○ Right
Element At Spiral Out: ○ Line ● Curve
Curve Radius At Spiral Out: 800.000
Min. Radius: 600
Max. Radius: 1100
End Point#
Pnt#:
Northing: 682308.5742
Easting: 2054598.7600
☐ Tangential to Previous Element
Angle Format: ○ NE ○ SE ○ SW ● NW ○ AZ ○ Gon
Bearing(dd.mmss): 66.000139
Deflection Angle(DD.MMSS): 0.000000

Once all the elements of the centerline are defined, the file can be saved and then plotted using the *Draw Centerline File* command.

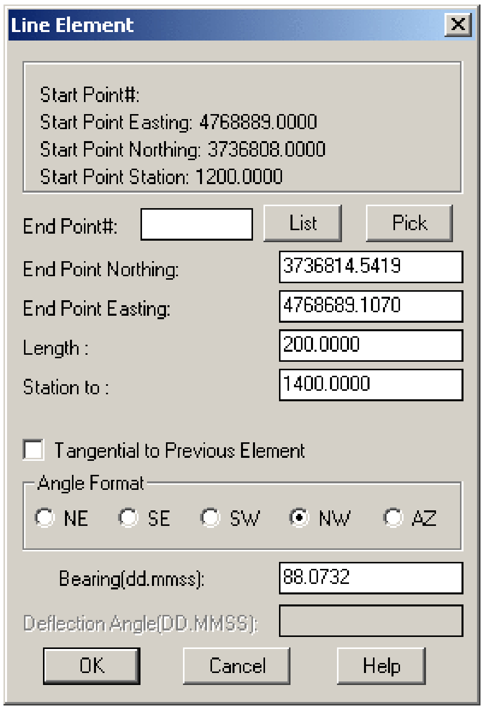
Here is an example of a highway interchange ramp that involves a starting tangent and a spiral curve that goes abruptly into a simple curve and then a final tangent. Start by entering a starting Northing and Easting and starting Station. The Start Point# is optional. Then the concept is that you click Add to add each subsequent element (line, curve, spiral-curve-spiral or spiral only):


List
Pick
Add
Edit
Remove
Up
Down
Load
Screen Pick
Tools
Draw
Save
SaveAs
Help
Fit Curve
Fit Spiral
Point Numbers
Station Equations
ROW
Exit

Starting Coordinates
Start Point#:
Start Station: 1200.0000
Start Northing: 3736808.0000
Start Easting: 4768889.0000
☐ Hold Other PI Points When Change Starting Point
☐ Zoom Drawing To Current Segment
Type of Curves: ● Roadway ○ Railroad
☐ Show Right of Way

Type of Element	Ending Station	Northing	Easting	Line/Arc Length	Tangent-Out

Line (Tangent) Segment: We want to enter the tangent segment length up to the TS (tangent to spiral). Enter in the length (200.0), bearing (88.0732) and then the bearing quadrant (NW). Since the next spiral-curve-spiral element can be based on a PI station, it is not necessary for this line segment to go up to the TS point. The purpose of this line segment is to establish the tangent-in direction.



Line Element

Start Point#:
Start Point Easting: 4768889.0000
Start Point Northing: 3736808.0000
Start Point Station: 1200.0000

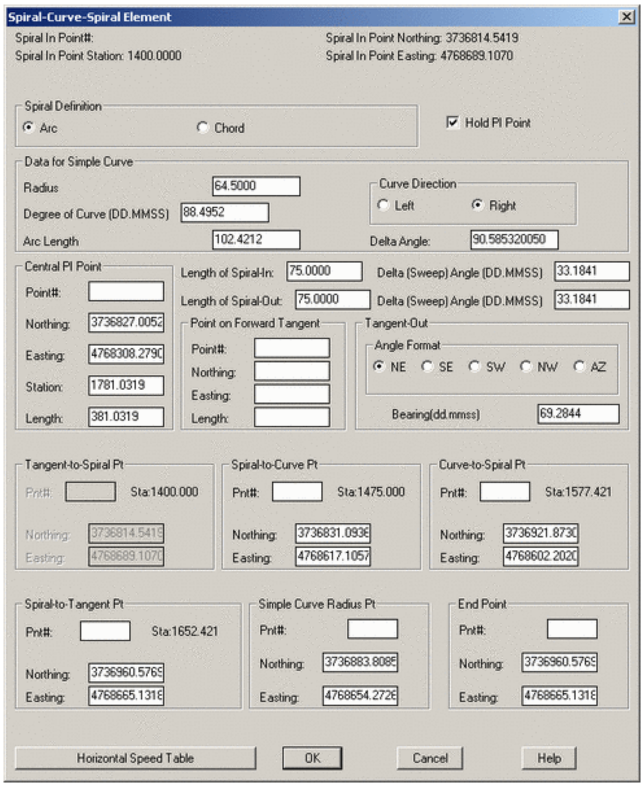
End Point#:
End Point Northing: 3736814.5419
End Point Easting: 4768689.1070
Length : 200.0000
Station to : 1400.0000

☐ Tangential to Previous Element

Angle Format: ○ NE ○ SE ○ SW ● NW ○ AZ

Bearing(dd.mmss): 88.0732
Deflection Angle(DD.MMSS):

When OK is clicked, the routine will add the Line element as the first in the list of complete centerline elements. Next up is Curve-Spiral-Curve. Click Add.



Spiral-Curve-Spiral Element

Spiral In Point#:
Spiral In Point Station: 1400.0000
Spiral In Point Northing: 3736814.5419
Spiral In Point Easting: 4768689.1070

Spiral Definition: ● Arc ○ Chord
☑ Hold PI Point

Data for Simple Curve
Radius: 64.5000
Degree of Curve (DD.MMSS): 88.4952
Arc Length: 102.4212
Curve Direction: ○ Left ● Right
Delta Angle: 90.585320050

Central PI Point
Point#:
Northing: 3736827.0052
Easting: 4768308.2790
Station: 1781.0319
Length: 381.0319

Length of Spiral-In: 75.0000
Delta (Sweep) Angle (DD.MMSS): 33.1841
Length of Spiral-Out: 75.0000
Delta (Sweep) Angle (DD.MMSS): 33.1841

Point on Forward Tangent
Point#:
Northing:
Easting:
Length:

Tangent-Out
Angle Format: ● NE ○ SE ○ SW ○ NW ○ AZ
Bearing(dd.mmss): 69.2844

Tangent-to-Spiral Pt
Pnt#: Sta:1400.000
Northing: 3736814.5419
Easting: 4768689.1070

Spiral-to-Curve Pt
Pnt#: Sta:1475.000
Northing: 3736831.0936
Easting: 4768617.1057

Curve-to-Spiral Pt
Pnt#: Sta:1577.421
Northing: 3736921.8730
Easting: 4768602.2020

Spiral-to-Tangent Pt
Pnt#: Sta:1652.421
Northing: 3736960.5769
Easting: 4768665.1318

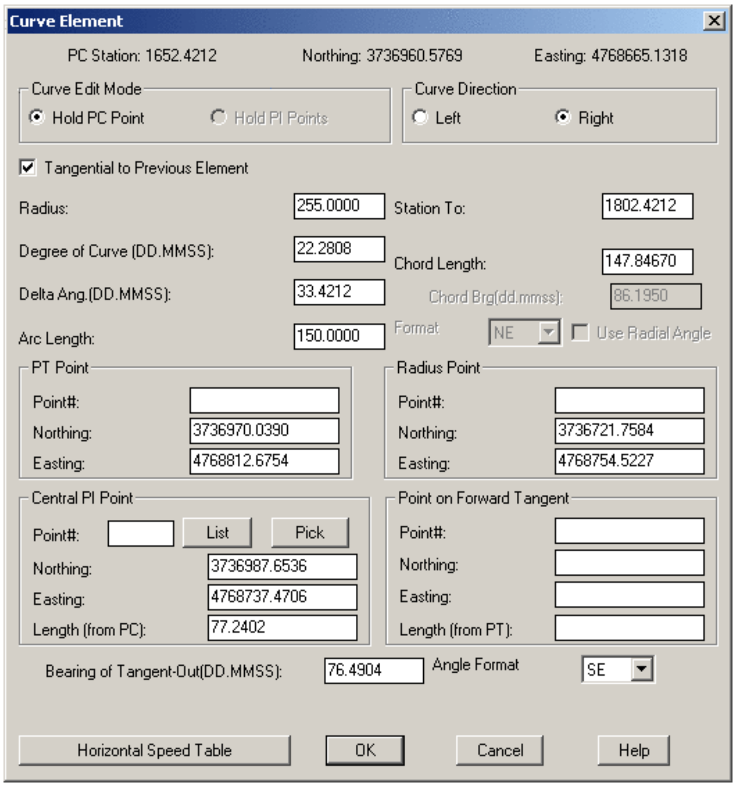
Simple Curve Radius Pt
Pnt#:
Northing: 3736883.8085
Easting: 4768654.2728

End Point
Pnt#:
Northing: 3736960.5769
Easting: 4768665.1318

Spiral Segment: Though the dialog is complex (for total flexibility), the key on a typical symmetrical spiral curve is to enter four things: (1) the radius of the simple curve, (2) the spiral in and out lengths, and (3) the tangent-out bearing. Everything else will calculate when you press Enter for the PI station.

Curve Segment: Add the next element and select curve. The Curve dialog appears. The key is to enter the Radius

Length (255), the Arc Length (150) and the Curve Direction. Everything else will calculate.


Curve Element

PC Station: 1652.4212
Northing: 3736960.5769
Easting: 4768665.1318

Curve Edit Mode: ● Hold PC Point ○ Hold PI Points
Curve Direction: ○ Left ● Right

☑ Tangential to Previous Element

Radius: 255.0000
Station To: 1802.4212
Degree of Curve (DD.MMSS): 22.2808
Chord Length: 147.84670
Delta Ang.(DD.MMSS): 33.4212
Chord Brg(dd.mmss): 86.1950
Arc Length: 150.0000
Format: NE
☐ Use Radial Angle

PT Point
Point#:
Northing: 3736970.0390
Easting: 4768812.6754

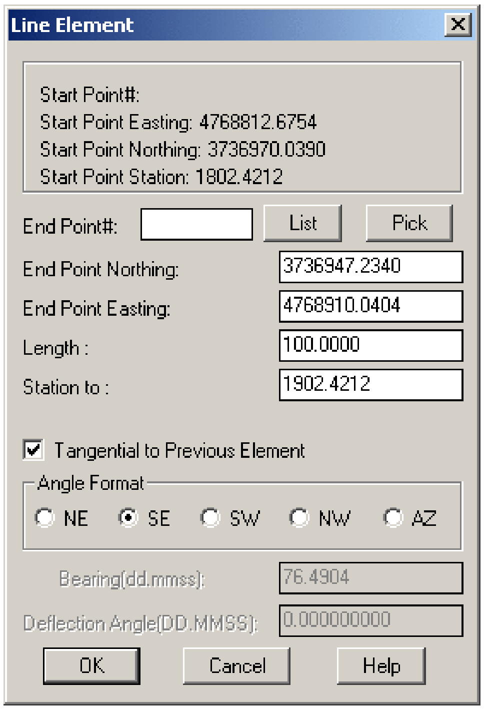
Radius Point
Point#:
Northing: 3736721.7584
Easting: 4768754.5227

Central PI Point
Point#:
Northing: 3736987.6536
Easting: 4768737.4706
Length (from PC): 77.2402

Point on Forward Tangent
Point#:
Northing:
Easting:
Length (from PT):

Bearing of Tangent-Out(DD.MMSS): 76.4904
Angle Format: SE

Final Line Segment: All you need to enter in the final dialog for the line (tangent) segment is its length. All other items will calculate when you press Enter.


Line Element

Start Point#:
Start Point Easting: 4768812.6754
Start Point Northing: 3736970.0390
Start Point Station: 1802.4212

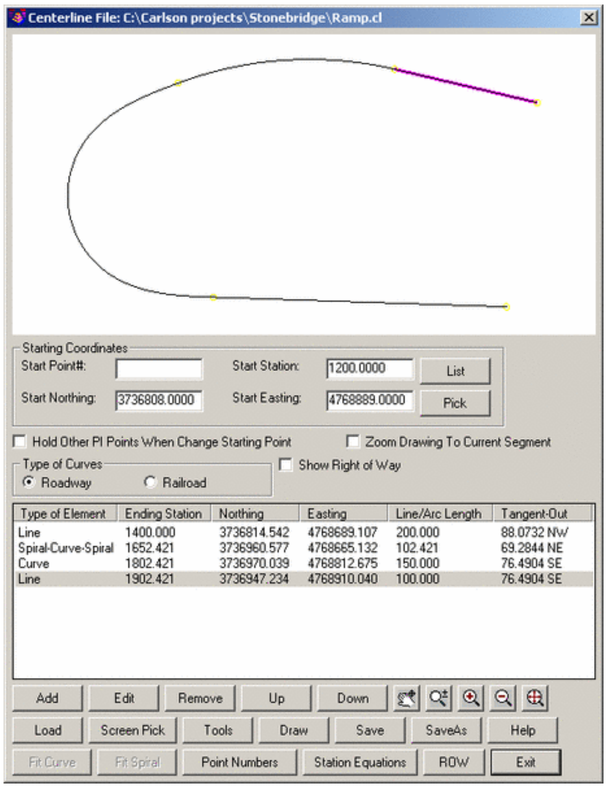
End Point#:
End Point Northing: 3736947.2340
End Point Easting: 4768910.0404
Length : 100.0000
Station to : 1902.4212

☑ Tangential to Previous Element

Angle Format: ○ NE ● SE ○ SW ○ NW ○ AZ

Bearing(dd.mmss): 76.4904
Deflection Angle(DD.MMSS): 0.000000000

The completed centerline will appear as shown in the dialog and each element can be edited. Pick the Save button to store this centerline data to a .CL file.



Centerline File: C:\Carlson projects\Stonebridge\Ramp.cl

Starting Coordinates

Start Point#:

Start Station: 1200.0000

Start Northing: 3736808.0000

Start Easting: 4768889.0000

☐ Hold Other PI Points When Change Starting Point

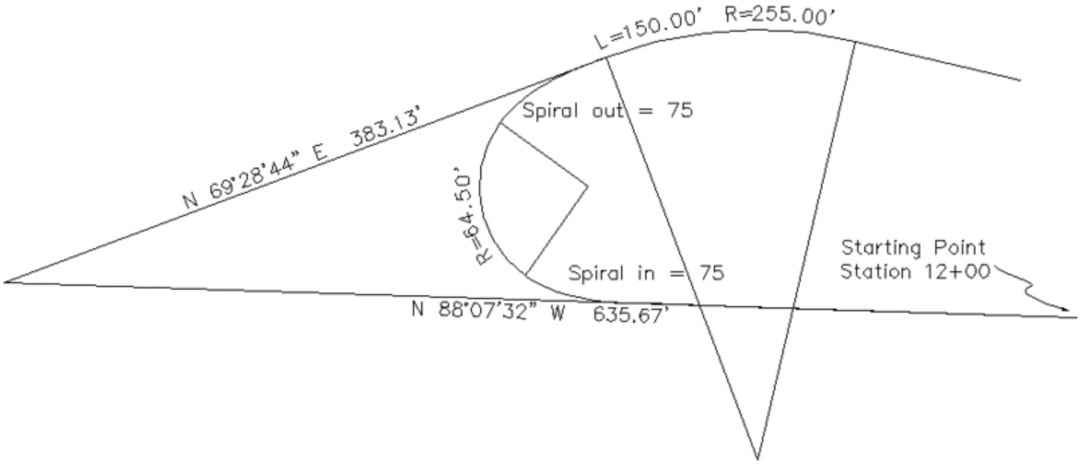
☐ Zoom Drawing To Current Segment

Type of Curves: ● Roadway ○ Railroad

☐ Show Right of Way

Type of Element	Ending Station	Northing	Easting	Line/Arc Length	Tangent-Out
Line	1400.000	3736814.542	4768689.107	200.000	88.0732 NW
Spiral-Curve-Spiral	1652.421	3736960.577	4768665.132	102.421	69.2844 NE
Curve	1802.421	3736970.039	4768812.675	150.000	76.4904 SE
Line	1902.421	3736947.234	4768910.040	100.000	76.4904 SE

List
Pick
Add
Edit
Remove
Up
Down
Load
Screen Pick
Tools
Draw
Save
SaveAs
Help
Fit Curve
Fit Spiral
Point Numbers
Station Equations
ROW
Exit



L=150.00'
R=255.00'
N 69°28'44" E 383.13'
Spiral out = 75
R=64.50'
Spiral in = 75
Starting Point
Station 12+00
N 88°07'32" W 635.67'

Pulldown Menu Location(s): Centerline (Survey, Civil), Roads (Construction, Takeoff)
Keyboard Command: cledit
Prerequisite: - None -

Polyline to Centerline File

This command writes a centerline (.CL) file from a polyline in the direction the polyline was drawn. The Northing and Easting for each vertex of the polyline is written to the centerline file and each arc in the polyline becomes a circular curve. After selecting the polyline, the program shows the direction by drawing temporary arrows along the polyline. To reverse the direction of the polyline, there is a keyword option R for Reverse at the Command line. Also, the Reverse Polyline command can be used to switch the direction of a polyline.

For stationing the centerline, there is a Command line prompt for entering the station at the beginning of the polyline and then using the polyline segment lengths for the rest of the centerline stations. Alternatively, there is a keyword option E for Ending to specify the station at the end of the polyline and then back calculating the centerline stations to the beginning using the polyline lengths.

In addition to being used as roadway/corridor "baselines," a .CL file can also be used as the horizontal control for a Template Point Centerline.

Note: To convert lines and/or arcs into a polyline, use the Entities to Polylines command or the Join Nearest command

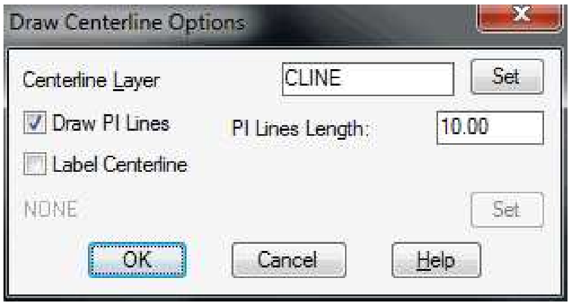
Prompts

Centerline file to Write dialog *Enter the .CL file name to create*
Centerline station [Reverse/Ending/<Beginning: 0+00>]: *Press Enter to accept the default station value specified* or *Type in the beginning station then press Enter*
Select polyline that represents centerline: *Pick the polyline that represents your centerline*

Pulldown Menu Location(s): Civil > Centerline, Survey > Centerline, Field > Roads
Keyboard Command: clpline
Prerequisite: A polyline drawn in the direction of increasing station values.

Draw Centerline File

This command reads a centerline (.CL) file and plots it as a 2D polyline in the drawing at the proper coordinates. First you are prompted for the layer name for the polyline to be created. There is also an option to specify whether to draw PI lines and specify their length. The Label Centerline option draws station labels using a .STA settings file created by the Save Settings function in the Station Polyline/Centerline command.


Draw Centerline Options

Centerline Layer: CLINE

☑ Draw PI Lines

PI Lines Length: 10.00

☐ Label Centerline

NONE

Next you are prompted for the file name of the centerline to plot.

The .CL file can be made with the following commands on the Design menu:*Polyline to CL File, Input-Edit Centerline* or *Design Centerline.* Drawing the centerline file is a way to check the .CL file data graphically for correctness. If a spiral exists in the .CL file, the spiral will be represented by polyline segments.

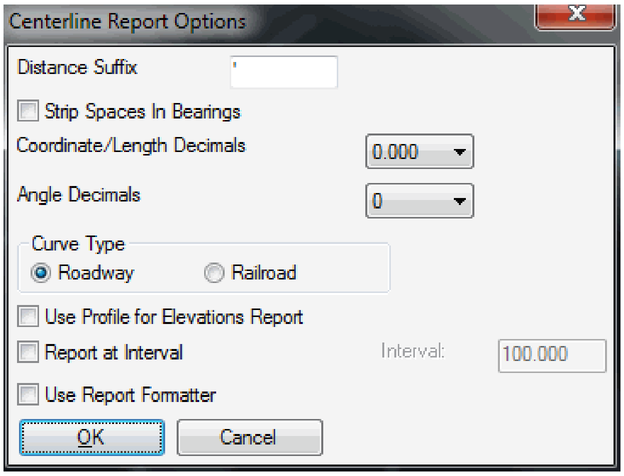
Prompts

Draw Centerline Options dialog
Centerline File to Draw file selection dialog Select the .CL file name to read and plot.

Pulldown Menu Location: Centerline
Keyboard Command: cl2pline
Prerequisite: a centerline file

Centerline Report

This command reads a centerline file and creates a report in the standard report viewer which can be written to a file, a printer, or to your drawing. If the centerline file contains point numbers, then the report will include these point numbers. If station equations are found, they are noted at the top of the report. The options dialog has settings for the report format and type of the centerline. The Use Profile for Elevations Report option will prompt you for a profile (.pro) file to add elevations to the report. The Report At Interval option will report stations, northing and easting at the specified station interval. The Use Report Formatter option lets you choose the report format and has output options for Excel.



Centerline Report Options

Distance Suffix: '

☐ Strip Spaces In Bearings

Coordinate/Length Decimals: 0.000

Angle Decimals: 0

Curve Type: ● Roadway ○ Railroad

☐ Use Profile for Elevations Report

☐ Report at Interval — Interval: 100.000

☐ Use Report Formatter

Here is an example report:

```
Centerline Report
Centerline File:  C:\sample\setback_3.cl

Station Northing Easting Bearing Distance
0+00.000 4033.165 4379.271
N 13°07'20'' W 92.076'
0+92.076 4122.836 4358.367 PC
Radius:  4196.621 4674.880 Radius Length:  325.000'
PI: 4159.044 4349.926 1+29.254 Tangent:  37.178'
Arc Len:  74.035' Delta:  13°03'07'' Right Degree:  17°37'46''
Chord Len:  73.875' Chord Brg:  N 06°35'47'' W
Radial-In:  N 76°52'40'' E Radial-Out:  N 89°55'47'' E
Tangential-In Tangential-Out
1+66.110 4196.222 4349.881 PT
```

Pulldown Menu Location: Centerline
Keyboard Command: clreport
Prerequisite: A centerline (.CL) file

Import Centerline

This command converts Terramodel, Geodimeter, GeoPak, Sokkia/Leitz, Softdesk, and Leica road files into Carlson TakeOff centerline (.CL) files.

Prerequisite: a Terramodel, Geodimeter, GeoPak, Sokkia/Leitz, Softdesk, or Leica road file

Import TDS RD5 File

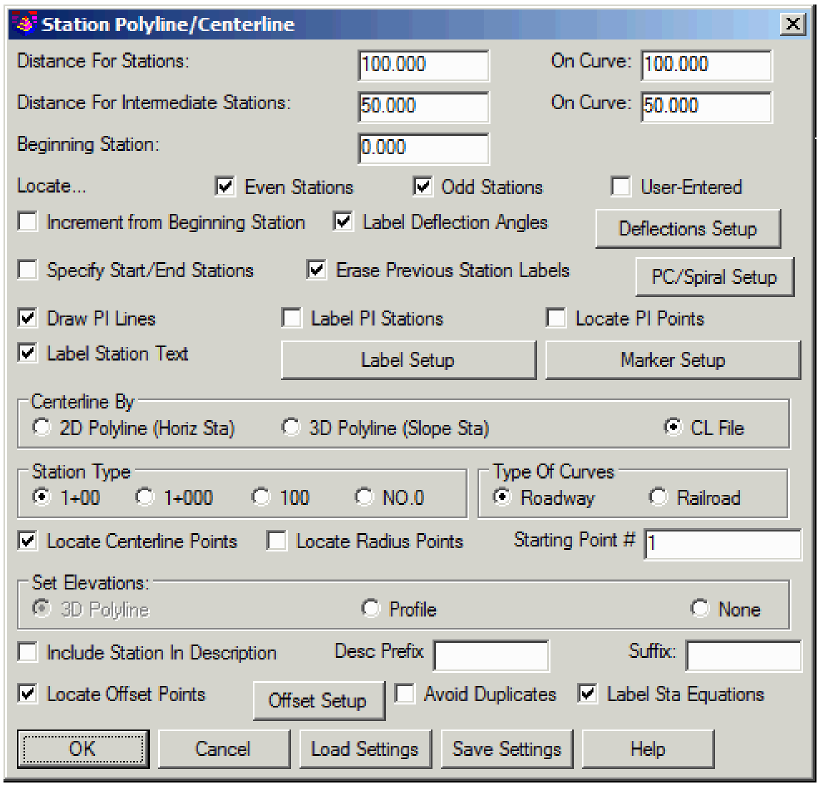
This command converts a TDS RD5 road file into TakeOff centerline (.CL) and profile (.PRO) files.

Prerequisite: a TDS RD5 file

Keyboard Command: importrd5

Station Polyline/Centerline

This command will station a polyline or centerline file at a given interval distance. The options for this command are set in the dialog shown below. After setting the options, click OK on the dialog and then pick the polyline or select the centerline file. All settings can be saved as (.STA) files and loaded for reuse, and for storing multiple stationing schemes. Polyline/Centerline station labels are also dynamic, and so will update when changes are made in the geometry.



Station Polyline/Centerline

Distance For Stations: 100.000 On Curve: 100.000

Distance For Intermediate Stations: 50.000 On Curve: 50.000

Beginning Station: 0.000

Locate... ☑ Even Stations ☑ Odd Stations ☐ User-Entered

☐ Increment from Beginning Station ☑ Label Deflection Angles

☐ Specify Start/End Stations ☑ Erase Previous Station Labels

☑ Draw PI Lines ☐ Label PI Stations ☐ Locate PI Points

☑ Label Station Text

Centerline By: ○ 2D Polyline (Horiz Sta) ○ 3D Polyline (Slope Sta) ● CL File

Station Type: ● 1+00 ○ 1+000 ○ 100 ○ NO.0

Type Of Curves: ● Roadway ○ Railroad

☑ Locate Centerline Points ☐ Locate Radius Points Starting Point # 1

Set Elevations: ● 3D Polyline ○ Profile ○ None

☐ Include Station In Description Desc Prefix: Suffix:

☑ Locate Offset Points ☐ Avoid Duplicates ☑ Label Sta Equations

Distance for Stations is the primary interval for stationing. **On Curve** allows for a different interval for curve segments verses line segments.

Distance for Intermediate Stations is the intermediate interval for stationing. **On Curve** allows for a different interval for curve segments verses line segments.

Beginning Station is the beginning station of the centerline for stationing.

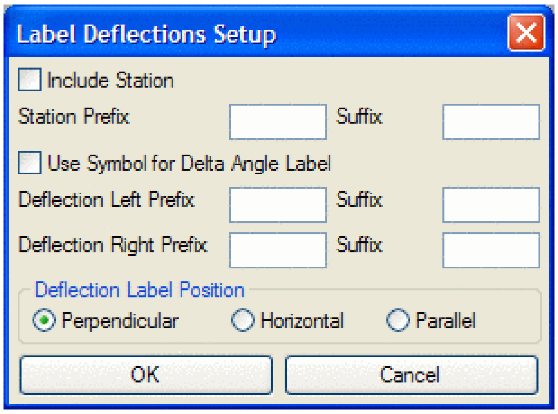
Locate Even Stations labels the stations at the distance interval (i.e. 2+00, 3+00, etc.).

Locate Odd Stations labels the non-interval stations at the polyline/centerline end points and PC and PT points.

Locate User-Entered prompts you for individual stations to label.

Without the **Increment Station Labels from Beginning Station** option, the program increments the station labels from zero. For example, if the station interval is 100 and the polyline starting station is 145, then the program will label 2+00, 3+00, etc. With this option active, the station labels are incremented from the starting station. In this example, the program would then label 2+45, 3+45, etc.

Label Deflection Angles adds this annotation to the stationing. Settings for this are specified in the **Label Deflections Setup**, accessed by the **Deflections Setup** button.

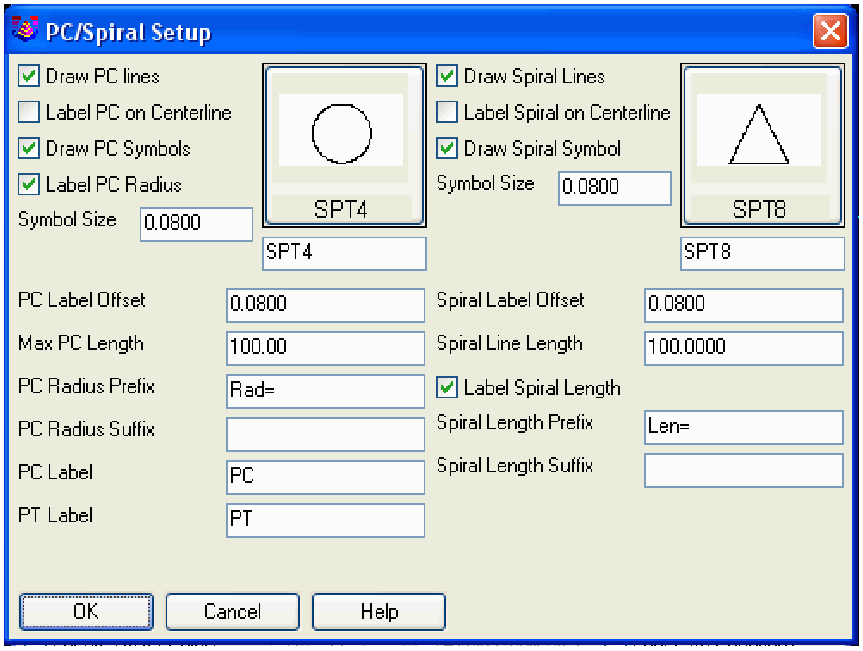

Label Deflections Setup

☐ Include Station
Station Prefix | Suffix
☐ Use Symbol for Delta Angle Label
Deflection Left Prefix | Suffix
Deflection Right Prefix | Suffix
Deflection Label Position: ● Perpendicular ○ Horizontal ○ Parallel

When **Specify Start/End Stations** is checked, only the stations between and including the specified starting and ending stations will be labeled. If locate centerline points and offset points are toggled on, only points within the specified stations will be located.

When **Erase Previous Station Labels** is checked, previous station labels are erased when new ones are generated.

The **PC/Spiral Setup PC** button accesses the **PC/Spiral Setup** dialog, where settings are controlled for lines and/or symbols and/or labels at the starting and ending (PC and PT) stations of an arc of the centerline as well as for the spiral special stations (TS, SC, CS, ST).


PC/Spiral Setup

☑ Draw PC lines
☐ Label PC on Centerline
☑ Draw PC Symbols
☑ Label PC Radius
Symbol Size 0.0800
SPT4
PC Label Offset 0.0800
Max PC Length 100.00
PC Radius Prefix Rad=
PC Radius Suffix
PC Label PC
PT Label PT

☑ Draw Spiral Lines
☐ Label Spiral on Centerline
☑ Draw Spiral Symbol
Symbol Size 0.0800
SPT8
Spiral Label Offset 0.0800
Spiral Line Length 100.0000
☑ Label Spiral Length
Spiral Length Prefix Len=
Spiral Length Suffix

Draw PC Lines controls whether lines are drawn from the PC and PT points.

When **Label PC On Centerline** is checked, the station of the PC and PT will be labeled on the centerline as well as the PC and PT lines. When not checked only the PC and PT lines will be labeled.

Draw PC Symbols controls whether symbols are placed at these locations. If checked, the desired symbol is selected by picking on the box to the right.

Label PC Radius controls whether this point is labeled.

Max Length controls the maximum length for the PC lines to be drawn described above.

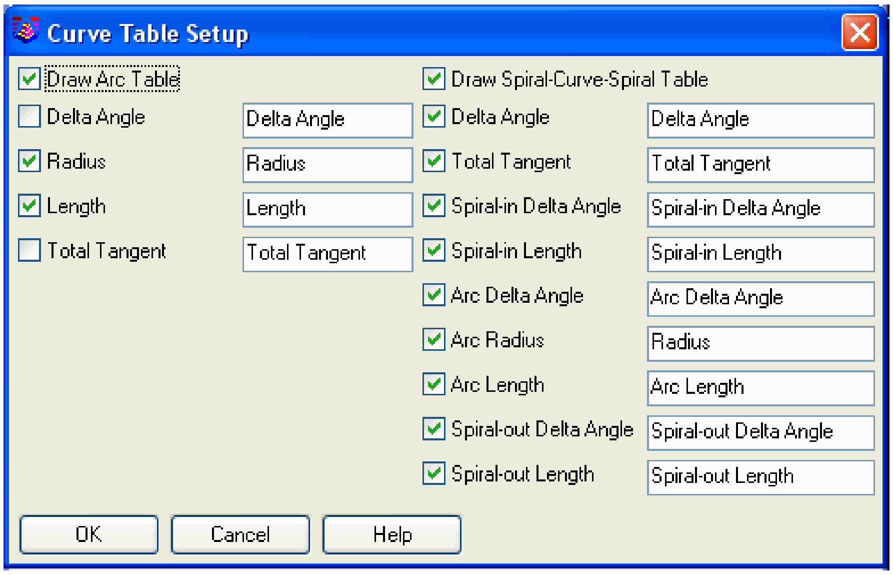
Back in the main Station Polyline/Centerline dialog box:

Draw PI Lines draws a 2 segment polyline in both tangent directions from the PI as a marker for the PI.

When **Label PI Stations** is checked, the PI station is labeled at the PI point.

When **Locate PI Points** is checked a point will be created at the PI of a horizontal curve graphically and written to the active coordinate file.

When **Label Station Text** is checked, this command places station text along the polyline at the angle of the corresponding segment. After toggling this option on, the *Label Setup* button will become available for selection. Select it to configure the label settings as desired. Select the *Marker Setup* options to modify the size of the markers for certain types of stations. See definitions following the dialog box.

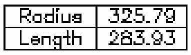


☑ Draw Arc Table

☐ Delta Angle	Delta Angle
☑ Radius	Radius
☑ Length	Length
☐ Total Tangent	Total Tangent

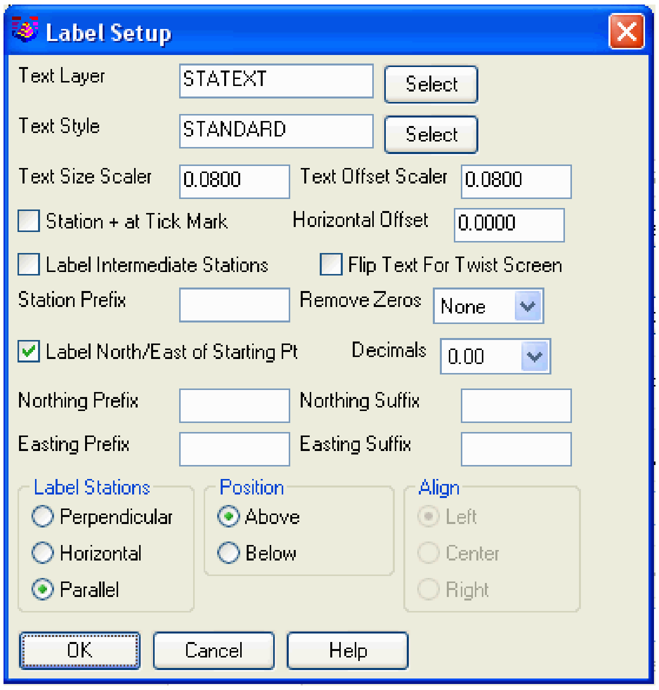
☑ Draw Spiral-Curve-Spiral Table

☑ Delta Angle	Delta Angle
☑ Total Tangent	Total Tangent
☑ Spiral-in Delta Angle	Spiral-in Delta Angle
☑ Spiral-in Length	Spiral-in Length
☑ Arc Delta Angle	Arc Delta Angle
☑ Arc Radius	Radius
☑ Arc Length	Arc Length
☑ Spiral-out Delta Angle	Spiral-out Delta Angle
☑ Spiral-out Length	Spiral-out Length



Radius	325.79
Length	283.93

Also under PC/Spiral Setup is **Curve Table Setup** which controls whether to draw data tables for the curves and spirals. When this option is on, the program creates a data table with the selected fields for each curve and automatically places each table to the outside of the curve.


Label Setup

Text Layer: STATEXT

Text Style: STANDARD

Text Size Scaler: 0.0800

Text Offset Scaler: 0.0800

☐ Station + at Tick Mark

Horizontal Offset: 0.0000

☐ Label Intermediate Stations

☐ Flip Text For Twist Screen

Station Prefix:

Remove Zeros: None

☑ Label North/East of Starting Pt

Decimals: 0.00

Northing Prefix:

Northing Suffix:

Easting Prefix:

Easting Suffix:

Label Stations: ○ Perpendicular ○ Horizontal ● Parallel

Position: ● Above ○ Below

Align: ● Left ○ Center ○ Right

Label Setup

- **Text Layer** is the user-specified layer for text labels to be drawn on.
- **Text Style** is the user-specified text style for labels.

- **Decimals** determines the number of decimal places of the stationing labels to be drawn for the odd stations and user entered stations only.

- **Text Size Scaler** determines the size of the station labels. This value multiplied by the horizontal scale setting in Drawing Setup results in the size of the label. For example, if the horizontal scale is set to 100 and the text size scaler is set to 0.10, the station labels will be 10 units.
- **Text Offset Scaler** works like text size scaler above controlling the distance the text labels will be offset from the centerline.

- If the **Flip Text For Twist Screen** setting is checked and the drawing has been twisted using the twist screen command, the label text will be flipped to read in the proper direction of the stationing.

- **Label Intermediate Stations:** If the intermediate distance is the same as the station distance then no intermediate station ticks or labels will be drawn. For example, with the above entries and 0+00 for the first station the stations will be labeled with descriptions as follows: 0+00 0+50 1+00 1+50, etc.

- **Station + at Tick Mark** labels the station text along the polyline with the '+' of the station text at the station's location on the polyline. See Marker Set up for marker size manipulation settings.
- **Horizontal Offset** shifts the station label along the centerline.
- **Station Prefix** adds to the front of the station labels.
- **Remove Zeros** removes the specified number of least significant digits from the station label if these digits are all zero.

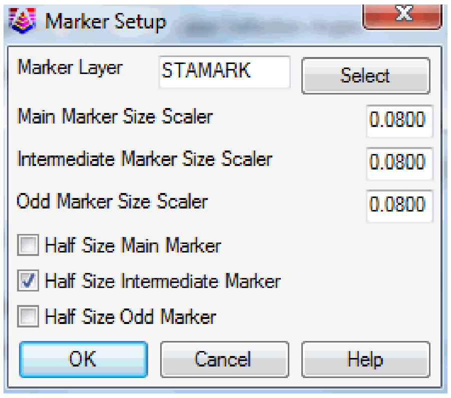
- **Label Northing/Easting of Starting Point** adds this label information, including prefixes and/or suffixes as specified.

- Use **Label Stations** to specify whether to label the stations perpendicular or parallel to the centerline.

- Specify the **Position** of the station labels, either above or below the centerline. This is only available when labeling stations using the parallel option.

- **Align** determines the alignment of the station label, either left or centerline, centered along the centerline or to the right of the centerline. This option is only available when using the perpendicular option for station labels.

The **Marker Setup** options control the size of markers for different station types as well as the layer the markers will be drawn on. The Half Size Main options draw a perpendicular tick mark on only one side of the centerline. Otherwise a full marker is drawn that goes of both sides of the centerline. There are separate Half Size options for the main station interval, intermediate station interval and odd stations.



Marker Setup

Marker Layer: STAMARK

Main Marker Size Scaler: 0.0800

Intermediate Marker Size Scaler: 0.0800

Odd Marker Size Scaler: 0.0800

☐ Half Size Main Marker

☑ Half Size Intermediate Marker

☐ Half Size Odd Marker

Specify whether to define the **Centerline By** picking a 2D polyline or 3D polyline in the drawing or selecting a centerline (.CL) file.

- Using a **2D Polyline** will result in horizontal distance stationing along the polyline.
- Using a **3D Polyline** will result in the slope distance stationing along the polyline.
- Using a **Profile Polyline** uses a polyline on a profile grid where the X coordinate represents the station and the Y coordinate represents the elevation. The station labels will use the distance along this profile polyline.
- Using a **CL File** will result in horizontal distance stations as with the 2D Polyline option only a prompt for the centerline to use will display.

Use **Station Type** to specify the stationing format to use.

Use **Type of Curves** to specify whether you are labeling a roadway curve (arc definition) or railroad curve (chord definition).

Locate Centerline Points will locate points and store them in the current CooRDinate file.

Locate Radius Points will locate the radius points of any arc segments.

Starting Point Number determines the starting point number for the points to be located.

Vertical Exaggeration applies to Profile Polyline mode. This factor is the ratio between the horizontal and vertical scales on the profile grid.

There are two ways to **Set Elevations** for the centerline points and offset points to be created.

- The **3D Polyline** option gets the elevation of the point from a specified 3D Polyline within the drawing.

- The **Profile** option will determine the elevation of the point based upon the same station in the profile file. You will be prompted for the profile file to read for the elevation reference.

- With the **None** option selected, no elevations will be determined for the points.

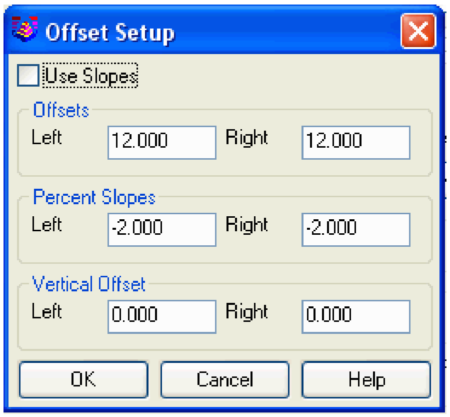
When **Include Station in Description** is checked, the station along the centerline will be included in the resulting offset point.

Description Prefix is an optional user-specified prefix to be added to the point description.

Description Suffix is an optional user-specified suffix to be added to the point description.

When **Label Sta Equations** is checked on any station equation, contained in a centerline (∗.cl) file will be labeled. This option is only available when stationing a centerline file (∗.cl).

Locate Offset Points will create points at the specified left and right offset distances from the centerline. Options for setting the elevations and descriptions of the points are available from the Offset Setup dialog.



Offset Setup

☐ Use Slopes

Offsets

Left 12.000 Right 12.000

Percent Slopes

Left -2.000 Right -2.000

Vertical Offset

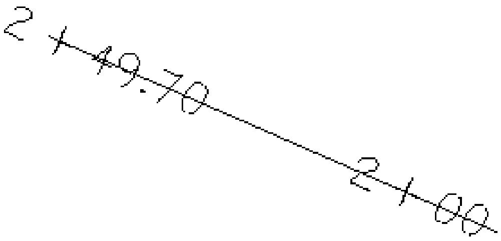
Left 0.000 Right 0.000

- When **Use Slopes** is on, it makes available the Percent Slopes fields for defining the slope from centerline both right and left for determining the elevations of the offset points.

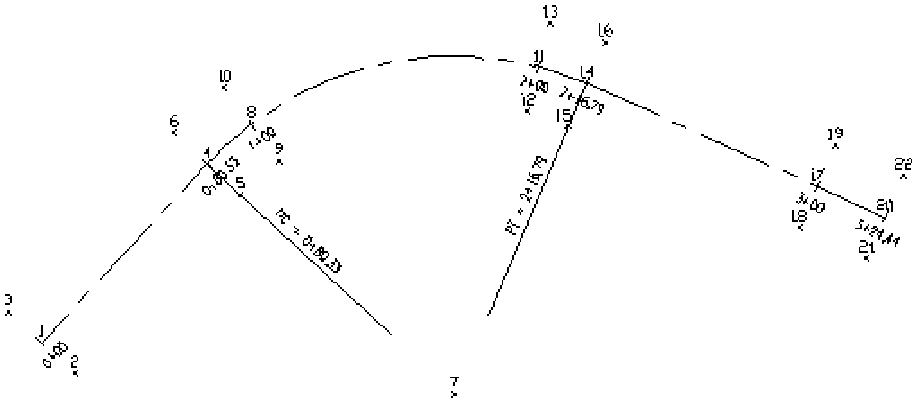
- Enter the desired **Offsets** left and right.
- Enter the desired **Percent Slopes** from centerline to the left and right offset points.
- The **Vertical Offset** is added to the elevation of the offset points.

Prompts

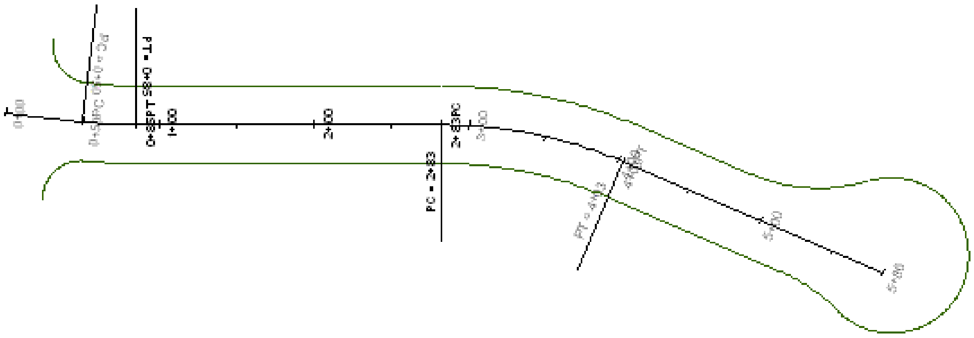
Station Polyline Dialog
Polyline should have been drawn in direction of increasing stations.
Select polyline that represents centerline: *select a polyline*



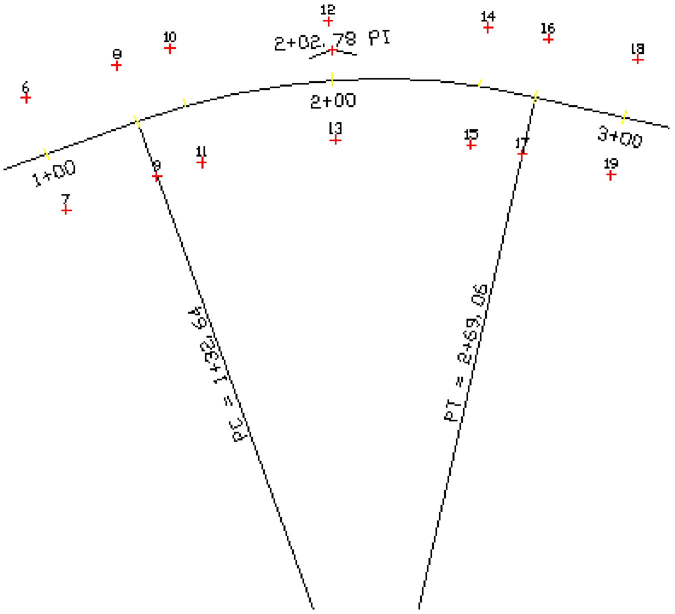
Closeup of Station + at Tick Mark option


PC = 0+80.20
PT = 2+16.79
0+00
1+00
2+00
2+16.79
3+00
3+24.44

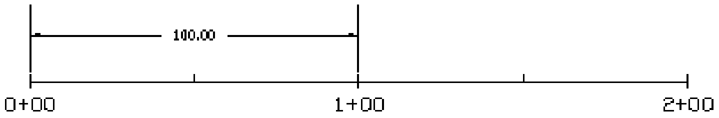
Labels with Label PC on Centerline checked on


0+00
PT = 0+85
PC = 2+83
1+00
2+00
3+00
5+00

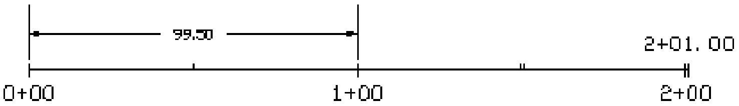
Labels set to perpendicular and Max Length of PC lines set to 75.0


12
14
16
18
10
8
6
2+02.78 PI
2+00
13
15
17
3+00
19
11
9
1+00
7
PC = 1+32.64
PT = 2+69.06

Labels with Draw PI Lines, Label PI Stations and Locate PI Points all checked on


100.00
0+00
1+00
2+00

Labels using Centerline By 2D Polyline (Horizontal Station)


99.50
2+01.00
0+00
1+00
2+00

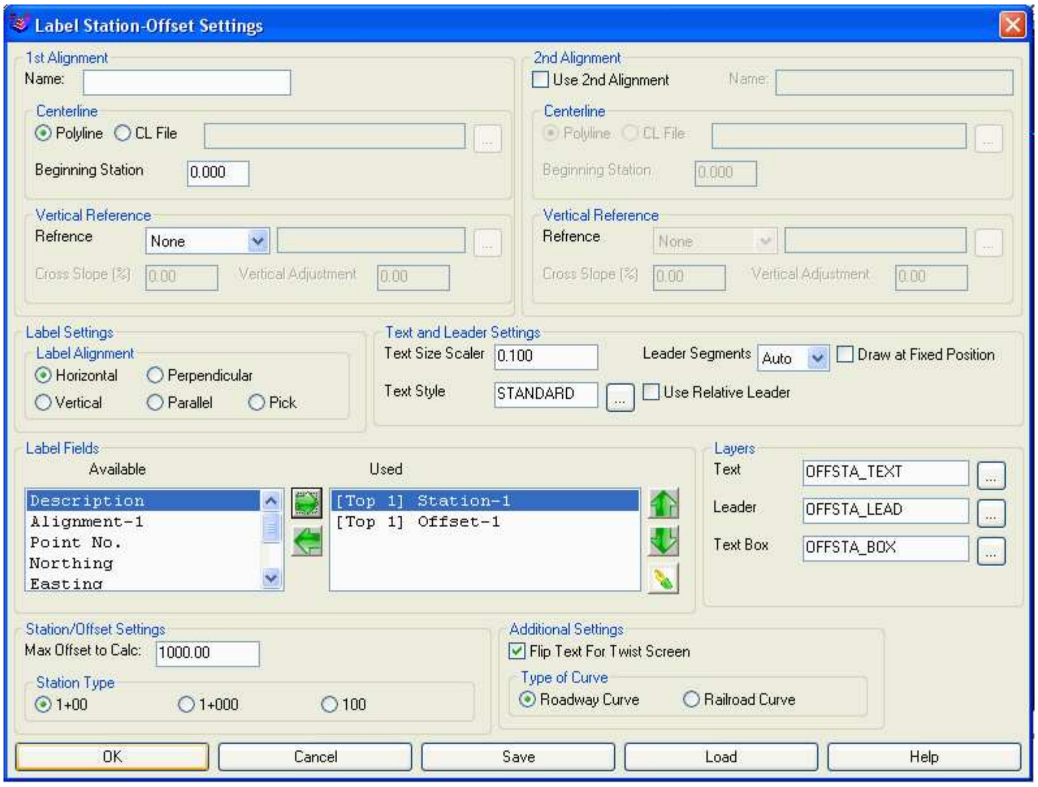
Labels using Centerline By 3D Polyline (Slope Station)

Pulldown Menu Location: Centerline
Keyboard Command: stapl
Prerequisite: A polyline or CL file

Label Station-Offset

This command will compute and label the station(s), offset(s) and elevation(s) of a selected point or group of points or entities. Additional labels for the name(s) of the reference alignment(s) and description(s) can also be specified and placed to further annotate the point(s) that are selected.

A common usage for using dual alignments and profiles typically involves the alignment and profile of a road coupled with the alignment and profile of a pipe/utility.



1st Alignment: Name:

Centerline: ● Polyline ○ CL File

Beginning Station: 0.000

Vertical Reference: Refrence: None

Cross Slope (%): 0.00 Vertical Adjustment: 0.00

2nd Alignment: ☐ Use 2nd Alignment Name:

Centerline: ● Polyline ○ CL File

Beginning Station: 0.000

Vertical Reference: Refrence: None

Cross Slope (%): 0.00 Vertical Adjustment: 0.00

Label Alignment: ● Horizontal ○ Perpendicular ○ Vertical ○ Parallel ○ Pick

Text Size Scaler: 0.100

Text Style: STANDARD

Leader Segments: Auto ☐ Draw at Fixed Position

☐ Use Relative Leader

Available: Description, Alignment-1, Point No., Northing, Easting

Used: [Top 1] Station-1, [Top 1] Offset-1

Layers: Text: OFFSTA_TEXT Leader: OFFSTA_LEAD Text Box: OFFSTA_BOX

Max Offset to Calc: 1000.00

Station Type: ● 1+00 ○ 1+000 ○ 100

☑ Flip Text For Twist Screen

Type of Curve: ● Roadway Curve ○ Railroad Curve

1st/2nd Alignment: Specify the criteria for either one or two alignments that will be used for the label(s) that will be placed into the drawing.

Use 2nd Alignment: Enable this toggle if multiple alignments are to be used for the label(s) that will be placed into the drawing.

Name: Supply a label-friendly value for the name of the alignment (*e.g.* "King Street" or "Water Main"). The value(s) specified get assigned to the **Alignment** Label Field.

Centerline: Indicate the source (Polyline or Centerline File) for the reference alignment. If the Polyline option is selected, you will be prompted to select the polyline(s) after the OK button is pressed. If CL File option is selected, supply a valid path and filename for the centerline file or navigate to the file using the "File Picker" button shown below. The Beginning Station will be determined from the selected Centerline File.

...

Beginning Station: Specify the beginning station of the centerline. The polyline should be drawn in the order of increasing stations. This control is not used when you use a centerline (.CL) file to define the centerline as the starting station of the centerline is stored in the .CL file.

Vertical Reference: Indicate the source (3D Polyline, Profile File or Road Network) for the reference elevation. With 3D Polylines, there will be an additional Slope Station available under the Label Fields in addition to the regular horizontal distance station. If the Profile option is selected, supply a valid path and filename for the profile file or navigate to the file using the "File Picker" button shown above. For the Road Network, specify the road network (.rdn) file with the "File Picker". With the Road Network method, the program will find the road design surface elevation for the specified points using all the road network design files including profiles, templates and transitions.

Cross Slope (%): Indicate the slope as a percentage to "travel" from the **Vertical Reference**. A value of 0 (zero) will not apply any cross slope from the reference elevation. Positive values will decrease the calculated elevation(s) and negative values will increase the calculated elevation(s).

Vertical Adjustment: Indicate the desired amount of vertical displacement that should applied to the calculated elevation. This is useful when deriving elevations for back or face of curb.

Label Alignment: Specify whether the labels should be Horizontal on the screen, Vertical on the screen, Parallel to the Centerline, Perpendicular to the Centerline, or user-specified by Picking.

Text Size Scaler: Determines the size of the labels. This value multiplied by the horizontal scale setting in *Drawing Setup* results in the size of the label. For example, if the horizontal scale is set to 100 and the text size scaler is set to 0.10, the labels will be 10 units.

Text Style: Specify the desired text style for the label.

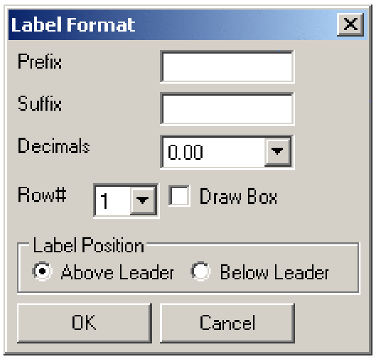
Leader Segments: Specify the desired number of leader segments that should be allowed when constructing the label.

Use Relative Leader: Indicate whether successive labels placed into the drawing should re-use the geometry of the initial leader placed with the command.

Draw Leader Arrow: Indicate whether to draw an arrowhead on the leaders.

Draw At Fixed Position: After you pick the first label position, the rest of the labels will be placed at this same level. This option applies to the Vertical and Horizontal Label Alignment methods.

Label Fields: Use the green arrow buttons to specify the items that are to appear in the labels. As labels are "moved" from Available to Used, a Label Format dialog box particular to the label will appear that will allow for more precise display control. To subsequently edit each item, use the Format Editor button as shown below.



Decimals 0.00

Row# 1

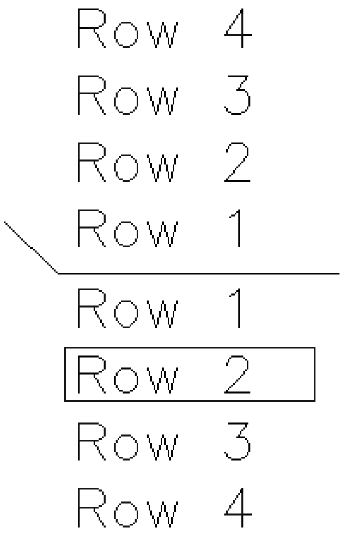
☐ Draw Box

Label Position

● Above Leader ○ Below Leader

Note:

- The Row Number value is specified as the row starting closest to the leader with subsequent rows moving further from the leader as shown in the figure below. Row 2 below the leader has been illustrated with the Draw Box option enabled.



Layers: Specify the layer of each item that comprises the label.

Max Offset to Calc: Specify the maximum offset to calculate.

Truncate Station at +: Removes the digits before the + in the station labels.

Station Type: Specify the stationing format to use.

Flip Text for Twist Screen: When this option is enabled, the label(s) will be flipped as necessary to adjust for the use of Twist Screen.

Add to Existing Point Description: When picking points to label by point #, this option appends the label to point description instead of creating a text label. The description is updated both in the coordinate file and for the point description attribute in the drawing.

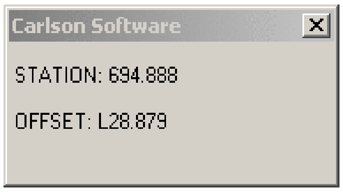
Type of Curve: Specify whether the centerline is for a roadway or railroad. Stationing for Roadway Curves is measured along the curve length itself whereas stationing for Railroad Curves is measured along chord segments.

Save: Allows the current settings to be saved to a Station-Offset Settings (∗.sos) file.

Load: Allows settings from a previously saved Station-Offset Settings (∗.sos) file to be recalled for use.

Prompts

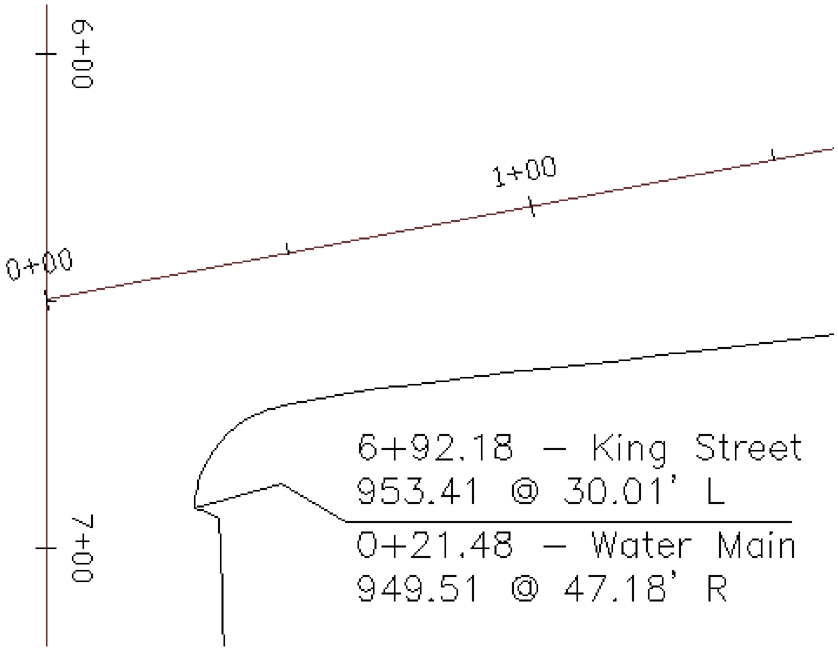
Polyline should have been drawn in direction of increasing stations.
Select Polyline Centerline (Alignment-1): *Pick the polyline centerline* This prompt will not appear if the Centerline File option was specified.
Select 3D Polyline Profile (Alignment-2): *Pick the polyline profile* This prompt will not appear if the Profile File option was specified.
Pick point or point numbers (SS for Selection Set,G for Group,Enter to End): Pick a point
Pick point to label: *Pick a leader vertex point*
Pick label alignment: *Pick angle for the label* This prompt will only appear if the Pick option was specified.
Pick point or point numbers (SS for Selection Set,G for Group,Enter to End): Press Enter



STATION: 694.888

OFFSET: L28.879

Real-time display of Station and Offset as you move the cursor.

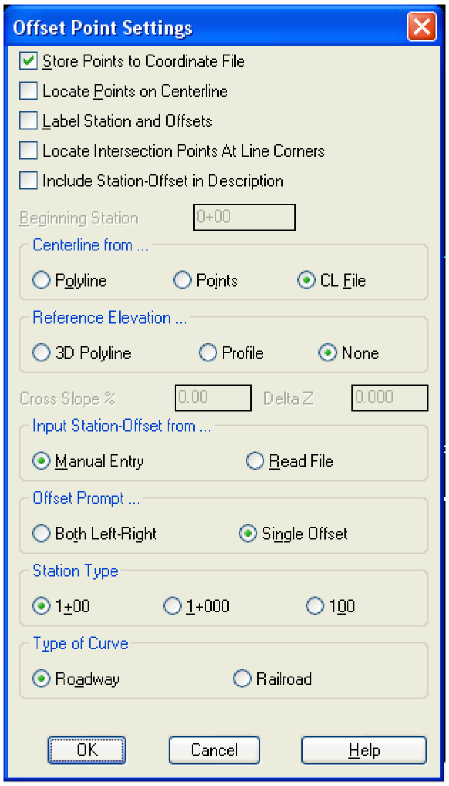


A sample label with a 2-segment leader.

Pulldown Menu Location: Centerline
Keyboard Command: offsta
Prerequisite: A polyline or centerline file.

Offset Point Entry

This command creates points along a centerline at specified stations and left and right offsets. The centerline can be defined by a polyline, centerline (.CL) file or two points.


Offset Point Settings

☑ Store Points to Coordinate File
☐ Locate Points on Centerline
☐ Label Station and Offsets
☐ Locate Intersection Points At Line Corners
☐ Include Station-Offset in Description

Beginning Station 0+00

Centerline from ...
○ Polyline ○ Points ● CL File

Reference Elevation ...
○ 3D Polyline ○ Profile ● None

Cross Slope % 0.00 Delta Z 0.000

Input Station-Offset from ...
● Manual Entry ○ Read File

Offset Prompt ...
○ Both Left-Right ● Single Offset

Station Type
● 1+00 ○ 1+000 ○ 100

Type of Curve
● Roadway ○ Railroad

The **Store Points to Coordinate File** option will store any points the current coordinate (.CRD) file. This includes centerline points and offset points.

When **Locate Points on Centerline** is checked, the program will locate points along the centerline, otherwise just the offset points will be created.

When **Label Stations & Offsets** is checked, the program will label the station-offset as the point description attribute.

When **Locate Intersection Points At Line Corners** is checked, the program will locate points along the centerline at the intersection points of selected lines with that of the centerline. This routine is to be used along with Locate Points on Centerline. This is a good option to use when the exact station of where the offset points are to be created is not known but is referenced by an existing line on the drawing.

The **Include Station-Offset In Description** option will add the station and offset of the point into the point description.

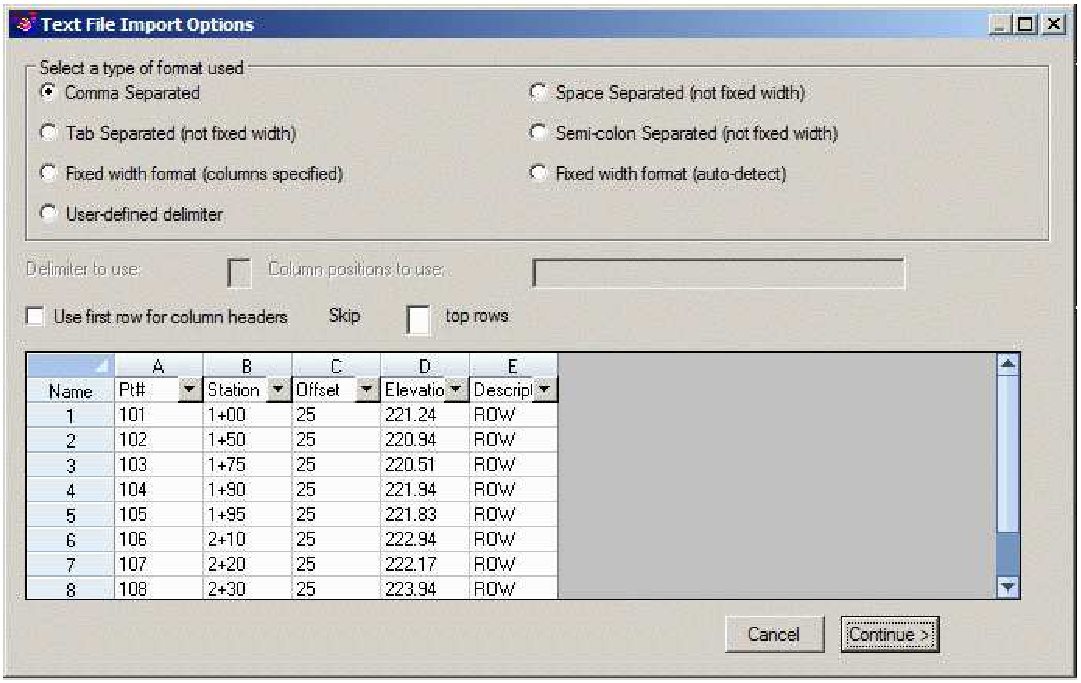
Beginning Station: Enter the Beginning Station of the Centerline.

Use **Centerline from** to specify whether to define the centerline by picking a polyline in the drawing, selecting a centerline (.CL) file, or using 2 points.

Use **Reference Elevation** to assign elevations to the points created when locating points on the centerline of offset points. When using a 3D Polyline for the elevation reference, points will be created at the station entered and the offsets specified with the elevation of the same station along the 3D polyline. The Profile option will do the same as the 3D Polyline option only it will use a profile file for the elevation reference. You will be prompted for the profile to use for the elevation reference. None simply creates 2d point data on elevation zero. The Reference Elevation option is good for creating points along the centerline for final grade elevation points. *Profile to 3D polyline* can be used to transfer the profile data to the polyline before calculating the final grade points.

Cross Slope %: This option is used to alter the elevations of the new points by applying either a Cross Slope calculation or a Delta Z variable.

The Manual Entry option in **Input Station-Offset from** will prompt for the station and offset distances. The **Read File** option will read the stations and offsets from a text file. The text file format with point number, station, offset, elevation and description. The program handles station formats with or without the '+' (i.e. either 250 or 2+50). The elevation and description are optional. The Read File option is a quick routine to convert a station-offset data file into coordinates. The delimiter for the text file and the order of the fields are set in the dialog shown here.



Text File Import Options

Select a type of format used

● Comma Separated
○ Space Separated (not fixed width)
○ Tab Separated (not fixed width)
○ Semi-colon Separated (not fixed width)
○ Fixed width format (columns specified)
○ Fixed width format (auto-detect)
○ User-defined delimiter

Delimiter to use: ☐ Column positions to use: ☐

☐ Use first row for column headers Skip ☐ top rows

	A	B	C	D	E
Name	Pt#	Station	Offset	Elevatio	Descripl
1	101	1+00	25	221.24	ROW
2	102	1+50	25	220.94	ROW
3	103	1+75	25	220.51	ROW
4	104	1+90	25	221.94	ROW
5	105	1+95	25	221.83	ROW
6	106	2+10	25	222.94	ROW
7	107	2+20	25	222.17	ROW
8	108	2+30	25	223.94	ROW

When **Offset Prompt** is set to Both Left-Right, the program will prompt for left and right offsets. If you respond to an offset prompt with zero (0), no offset point is created. The Single Offset option will prompt for one offset per station. Enter a right offset with a positive value and a left offset as a negative value.

Use **Station Type** to specify the stationing format to use.

Use **Type of Curve** to specify whether the curves are for a roadway or railroad.

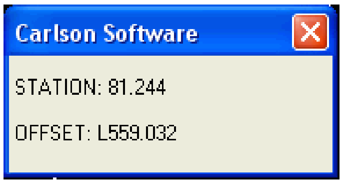
Prompts

Offset Point Settings Dialog
Polyline should have been drawn in direction of increasing stations.
Select Polyline near endpoint which defines first station.
[nea on] Select Polyline to Station-Measure: *select a polyline*
(5309.0 4845.0) Station: 0.00
(5526.0 4917.0) Station: 228.63
Distance from beginning station along centerline (Enter to end): *110*
Starting Segment Station: 0.0 Ending Segment Station: 228.633
Working Line segment...(5413.4 4879.64 0.0)
Left offset distance <10.0>: *15*
Right offset distance <15.0>: *20*
Distance from beginning station along centerline (Enter to end): *press Enter*

Keyboard Command: offpts
Prerequisite: A centerline (.CL) file, polyline, or two points

Calculate Offsets

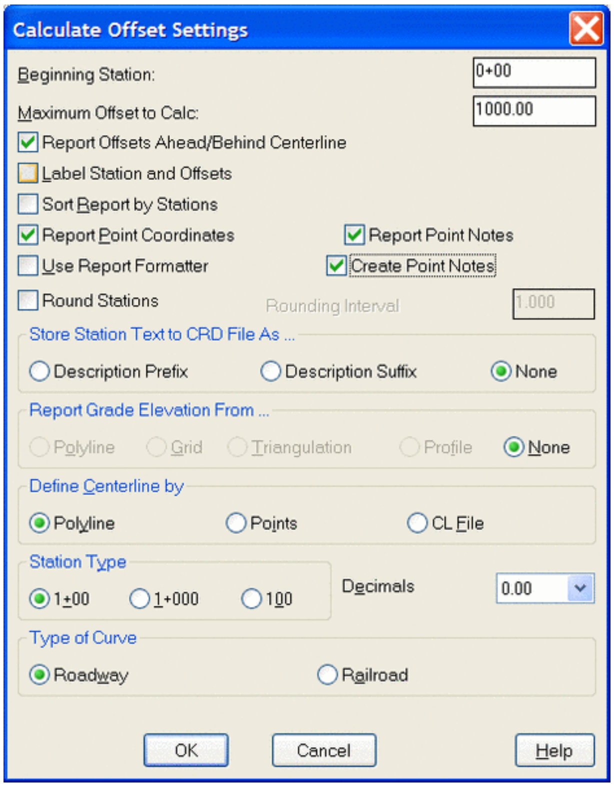
This command calculates the station and offsets of point coordinates relative to a centerline. The points to calculate can be stored in a coordinate (.CRD) file or picked on the screen. As the crosshairs are moved, the station and offset of the current position are displayed in real-time in a small window (see example).



Carlson Software

STATION: 81.244

OFFSET: L559.032



Calculate Offset Settings

Beginning Station: 0+00

Maximum Offset to Calc: 1000.00

☑ Report Offsets Ahead/Behind Centerline

☐ Label Station and Offsets

☐ Sort Report by Stations

☑ Report Point Coordinates ☑ Report Point Notes

☐ Use Report Formatter ☑ Create Point Notes

☐ Round Stations Rounding Interval 1.000

Store Station Text to CRD File As ...

○ Description Prefix ○ Description Suffix ● None

Report Grade Elevation From ...

○ Polyline ○ Grid ○ Triangulation ○ Profile ● None

Define Centerline by

● Polyline ○ Points ○ CL File

Station Type

● 1+00 ○ 1+000 ○ 100

Decimals 0.00

Type of Curve

● Roadway ○ Railroad

Beginning Station: Specify the beginning station of the centerline. The polyline should be drawn in the order of increasing stations. Not available when you use a centerline (.CL) file to define the centerline.

Maximum Offset to Calc: This is the maximum distance from the Centerline for which offsets are calculated.

Report Offsets Ahead/Behind Centerline: When checked, this option shows offsets for points or picked points located before the beginning station and after the ending station of the centerline.

Label Station and Offsets: When checked, the station offsets will be labeled in the drawing.

Sort Report by Stations: When checked, this option will report the station-offsets in station order no matter what order the points were calculated.

Report Point Coordinates: When checked, this option will include the point northing and easting in the report.

Report Point Notes: When checked point notes will be included on the calculate offset report.

Create Point Notes: When checked, the station and offset of the offset point will be created as notes and written to a note file (∗.not). This note file will have the same name as the crd file.

Use Report Formatter: When checked, the output of this command is directed to the Report Formatter which allows you to customize the layout of the report fields and can be used to output the data to Microsoft® Excel or Microsoft® Access. You must check this option on in order to use the Report Grade Elevation From option.

Round Stations: When checked, this option will round the stations for the selected points on the report to the Rounding Interval specified. For example if an offset point is located at station 1+01, and the rounding interval is set to 10, then the report will show the offset point at station 1+00.

Store Station Text to CRD File: When checked, the station offset text is appended to point numbers that are selected.

Report Grade Elevation From: When checked, this option will calculate an elevation for each point from a 3D polyline, grid file (.grd) or triangulation (.flt) file. To Use this option, the *Report Formatter* must be toggled on. The grade elevation is reported and compared with the point elevation to report the cut/fill. For the 3D polyline option, the grade elevation is calculated by finding the elevation at the point on the 3D polyline that is the nearest perpendicular position from the offset point. The 3D polyline that is used for elevations does not need to be the same polyline that is used as the centerline for the station-offset calculations.

Define Centerline by: Specify whether to define the centerline by picking a polyline in the drawing, selecting a centerline (.CL) file, or using 2 points. The polyline mode can be either 2D or 3D for horizontal or slope distance stationing.

Station Type: Specify the stationing format to use.

Decimals: Specify the display precision for the stations and offsets.

Type of Curve: Specify whether the curves are for a roadway or railroad.

Prompts

Calculate Offset Settings Dialog
Polyline should have been drawn in direction of increasing stations.
Select Polyline near endpoint which defines first station.
[nea on] Select Polyline Centerline: *select polyline centerline*
(5309.0 4845.0) Station: 0.00
(5526.0 4917.0) Station: 228.63
PtNo. North(y) East(x) Elev(z) Description
140 4889.13 5410.25 0.00 1+10.00L10.00
Station on Line> 1+10.00 Offset> 10.00 Left
PtNo. North(y) East(x) Elev(z) Description
141 4870.15 5416.55 0.00 1+10.00R10.00
Station on Line> 1+10.00 Offset> 10.00 Right
+ before station denotes point is ahead of line segment, - denotes beyond.
Pick point or point numbers (Enter to End): *22-28*

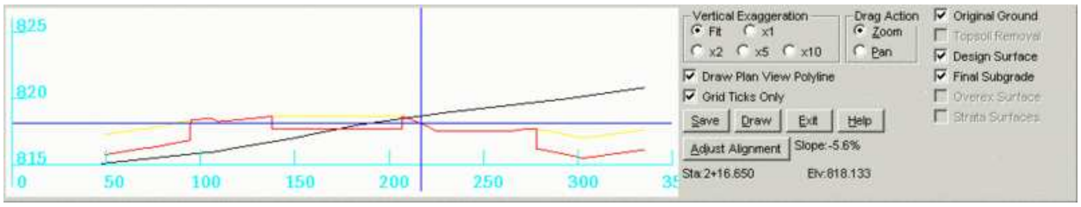
```
 Station   Offset  Description  Elev  Pt#  North    East
4+95.89L   15.48   Catch Basin  0.00  22   4811.00  4454.00
5+78.43L   58.18   Power Pole   0.00  23   4839.00  4548.00
6+77.26L   57.28   Power Pole   0.00  24   4868.00  4656.00
9+01.55R   16.81   Catch Basin  0.00  25   4745.00  4887.00
10+50.51L  25.39   Traffic Sign 0.00  27   4872.00  5043.00
4+03.48R  22.15    Light Pole   0.00  28   4657.00  4454.00
```

Pick point or point numbers (Enter to End): *press Enter*

Keyboard Command: calcoff
Prerequisite: A centerline (.CL) file, polyline or two points

Quick Profile From Surfaces

This command allows you to create, view, edit, and report profiles from the TakeOff surfaces.



Vertical Exaggeration
● Fit ○ x1
○ x2 ○ x5 ○ x10

Drag Action
● Zoom
○ Pan

☑ Draw Plan View Polyline
☑ Grid Ticks Only

☑ Original Ground
☐ Topsoil Removal
☑ Design Surface
☑ Final Subgrade
☐ Overex Surface
☐ Strata Surfaces

Slope:-5.6%
Sta:2+16.650 Elv:818.133

Pick starting point (CL-Centerline,P-Polyline): To make a profile you need to define the alignment by: 1) picking points on the screen; 2) typing in CL in the command prompt, and selecting a centerline file; or 3) typing in P and choosing a polyline from the screen. After doing so, the above profile viewer is created.

The far right dialog box allows you to toggle on and off different Surfaces to view in the profile viewer including: Original Ground, Topsoil Removal, Design Surface, Final Subgrade, Overex Surface, Strata Surfaces. If a surface is not defined in the current TakeOff project, like Topsoil Removal in this example, than you will not have the option to display it. In this example, the three Surfaces that can be displayed, Original Ground, Design Surface, and Final Subgrade, are displayed in the profile viewer.

When you move the cursor around the profile viewer a crosshair follows along the surface and reports the Station, Slope %, and Elevation at each point. It is displayed towards the bottom-right side of the screen next to Adjust Alignment. In this example the station is 2+16.650, the Slope is -5.6%, and the Elevation is 818.133. A crosshair can been seen in the profile drawing and along the alignment in the main drawing as well.

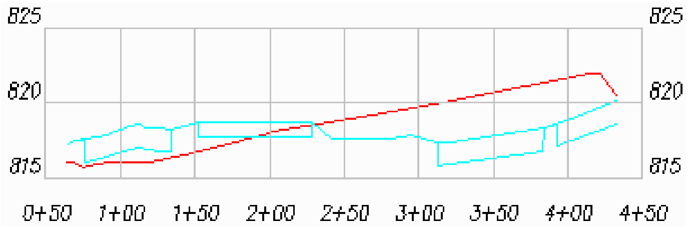
Vertical Exaggeration: x1 is the actual appearance of the surface(s). Depending on the flatness of the surface(s), you can select x2, x5, x10 vertical exaggerations to better see the elevation differentiation and different surfaces. The option Fit automatically exaggerates the vertical to best fit the profile viewer.

Drag Action: This dialog allows you to zoom in and out, and pan around the profile. To zoom in click and drag up, to zoom out click and drag down. To Pan, click amd drag the direction you want to move.

The Adjust Alignment icon allows to pick the polyline or centerline that you used and move it to your liking. If you selected an endpoint vertex, you can pivot that vertex around 360 degrees and the profiles will update in real time. This is helpful when checking for spikes. If you select the middle vertex then you can shift the entire centerline around.

If you created a profile alignment by picking points and you want to save that polyline you created then toggle on Draw Plan View Polyline. If you do not choose Draw Plan View Polyline than the polyline will be lost when you exit out of the Quick Profile command. Grid Ticks Only marks elevations and distances but does not draw them into grids.

The Save icon allows you to save the profile as a (.pro) file by whatever name you give it. The Draw icon allows you to draw the profile right on your drawing. Set the layer name, vertical and horizontal scale as desired, pick a starting point to draw, and the profile is created. Note: the below example has a veritcal scale of 5 feet per grid and a horizontal scale of 50 feet per grid.



Prompts

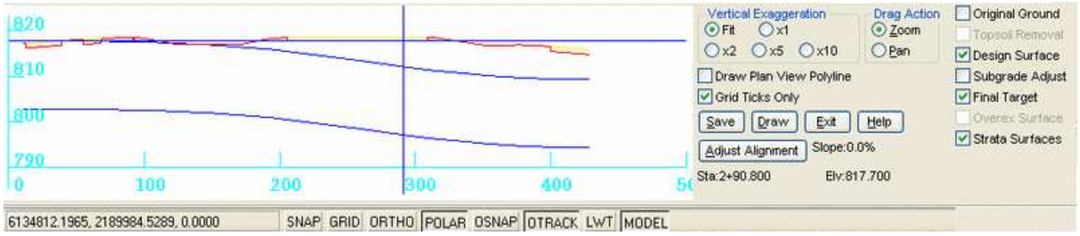
```
Command:
QUICKPRO
Pick starting point (CL-Centerline,P-Polyline): p

Polyline should have been drawn in direction of increasing stations.
CL File/<Select polyline that represents centerline>:
Loading edges...
Loaded 5057 points and 14923 edges
Created 9866 triangles
```

Prerequisite: a surface

Keyboard Command: TK_QUICKPRO

Quick Profile From Surface Entities

This command allows you to create, view, edit, and report profiles from the TakeOff surfaces.


820
810
800
790
0
100
200
300
400
50
Vertical Exaggeration
● Fit
○ x1
○ x2
○ x5
○ x10
Drag Action
● Zoom
○ Pan
☐ Draw Plan View Polyline
☑ Grid Ticks Only
Save
Draw
Exit
Help
Adjust Alignment
Slope:0.0%
Sta:2+90.800
Elv:817.700
☐ Original Ground
☐ Topsoil Removal
☑ Design Surface
☐ Subgrade Adjust
☑ Final Target
☐ Overex Surface
☑ Strata Surfaces
6134812.1965, 2189984.5289, 0.0000
SNAP
GRID
ORTHO
POLAR
OSNAP
OTRACK
LWT
MODEL

Pick starting point (CL-Centerline,P-Polyline): To make a profile you need to define the alignment by: 1) picking points on the screen; 2) typing in CL in the command prompt, and selecting a centerline file; or 3) typing in P and choosing a polyline from the screen. After doing so, the above profile viewer is created.

The far right dialog box allows you to toggle on and off different Surfaces to view in the profile viewer including: Original Ground, Topsoil Removal, Topsoil Replacement, Design Surface, Final Subgrade, Overex Surface, Strata Surfaces. If a surface is not defined in the current TakeOff project, like Topsoil Removal in this example, than you will not have the option to display it. In this example, the three Surfaces that can be displayed, Original Ground, Design Surface, and Final Subgrade, are displayed in the profile viewer.

When you move the cursor around the profile viewer a crosshair follows along the surface and reports the Station, Slope %, and Elevation at each point. It is displayed towards the bottom-right side of the screen next to Adjust Alignment. In this example the station is 2+16.650, the Slope is -5.6%, and the Elevation is 818.133. A crosshair can been seen in the profile drawing and along the alignment in the main drawing as well.

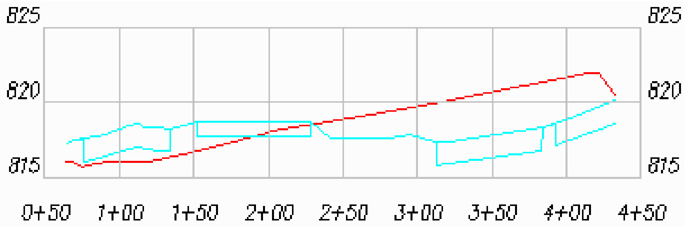
Vertical Exaggeration: x1 is the actual appearance of the surface(s). Depending on the flatness of the surface(s), you can select x2, x5, x10 vertical exaggerations to better see the elevation differentiation and different surfaces. The option Fit automatically exaggerates the vertical to best fit the profile viewer.

Drag Action: This dialog allows you to zoom in and out, and pan around the profile. To zoom in click and drag up, to zoom out click and drag down. To Pan, click amd drag the direction you want to move.

The Adjust Alignment icon allows to pick the polyline or centerline that you used and move it to your liking. If you selected an endpoint vertex, you can pivot that vertex around 360 degrees and the profiles will update in real time. This is helpful when checking for spikes. If you select the middle vertex then you can shift the entire centerline around.

If you created a profile alignment by picking points and you want to save that polyline you created then toggle on Draw Plan View Polyline. If you do not choose Draw Plan View Polyline than the polyline will be lost when you exit out of the Quick Profile command. Grid Ticks Only marks elevations and distances but does not draw them into grids.

The Save icon allows you to save the profile as a (.pro) file by whatever name you give it. The Draw icon allows you to draw the profile right on your drawing. Set the layer name, vertical and horizontal scale as desired, pick a starting point to draw, and the profile is created. Note: the below example has a veritcal scale of 5 feet per grid and a horizontal scale of 50 feet per grid.



Prompts

```
Command:
QUICKPRO
Pick starting point (CL-Centerline,P-Polyline): p

Polyline should have been drawn in direction of increasing stations.
CL File/<Select polyline that represents centerline>:
Loading edges...
Loaded 5057 points and 14923 edges
Created 9866 triangles
```

Prerequisite: a surface

Keyboard Command: QUICKPRO

Profile From Existing Surface

This command will create a profile file (.pro) for the existing surface. To define the profile alignment, type in CL in the command prompt, and select a centerline file, or pick the polyline from the screen. This will create the profile file. You can now use the other Profile commands to draw, edit and report from this profile.

Prompts

```
Command: progrid2

Polyline should have been drawn in direction of increasing stations.
CL File/<Select polyline that represents centerline>:
Enter the starting station <0.0>:

Loading edges...
Loaded 574 points and 1393 edges
Created 820 triangles
```

```
Found 19 profile points.
```

Prerequisite: a surface

Keyboard Command: progrid2

Profile From Design Surface

This command will create a profile file (.pro) for the design surface. To define the profile alignment, type in CL in the command prompt, and select a centerline file, or pick the polyline you want to use from the screen. This will create the profile file. You can now use the other Profile commands to draw, edit, and report from this profile.

Prompts

```
Command: progrid3

Polyline should have been drawn in direction of increasing stations.
CL File/<Select polyline that represents centerline>:
Enter the starting station <0.0>:

Loading edges...
Loaded 574 points and 1393 edges
Created 820 triangles

Found 19 profile points.
```

Prerequisite: a surface

Keyboard Command: progrid3

Design Road Profile

This command is for simultaneously creating a .pro file and drawing the road profile. The procedure is to first specify the on-screen grid and then enter or pick the stations and elevations.

Once two segments have been entered, you will be prompted for the vertical length. If you don't want a vertical curve, enter 0. Otherwise you can directly enter the vertical curve, or enter the sight distance or the K-value from which the vertical curve is calculated. The vertical curve can also be specified to pass through a point or do a best fit through multiple points. This through point option would be useful for hitting an existing feature such as a driveway on the vertical curve. Unequal vertical curves is another option where the vertical curve length going into the PVI differs from the length leaving the PVI. Before using your entry, the vertical curve, sight distance, and K-value are displayed. Object height and eye height are two variables that effect the vertical curve.

Notice that the station, elevation, and slope at the current position of your cursor crosshairs are displayed in real-time in a small dialog.

Prompts

File Selection dialog Specify a profile file to create.

Profile Settings dialog

Station of first PVI or pick a point: *0*

Elevation of PVI: *565*

Station of second PVI or pick a point ('U' to Undo): *200*

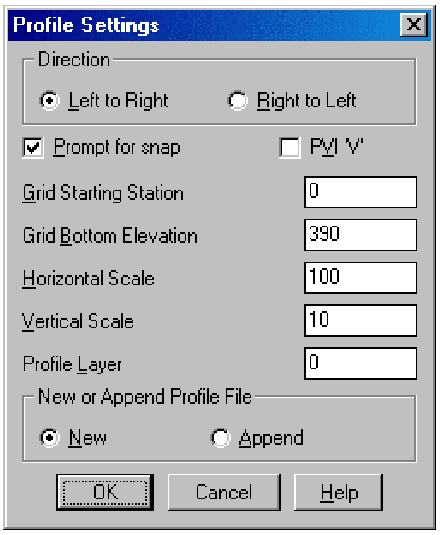
Percent grade entry/Ratio/<Elevation of PVI>: *575*

Station of next PVI or pick a point ('U' to Undo, Enter to End): *pick a point*

Snap PVI dialog

The Snap PVI dialog box appears when you pick a point (if the Prompt for Snap option in the Profile Settings dialog is selected). The station and slope may be changed to the nearest snap value. The elevation is the free variable and it will change to compensate for any snap. To change the elevation, select the elevation edit box and enter the new value.

View Table/Unequal/Through pt/Sight Distance/K-value/<Length of Vertical Curve>: *100*



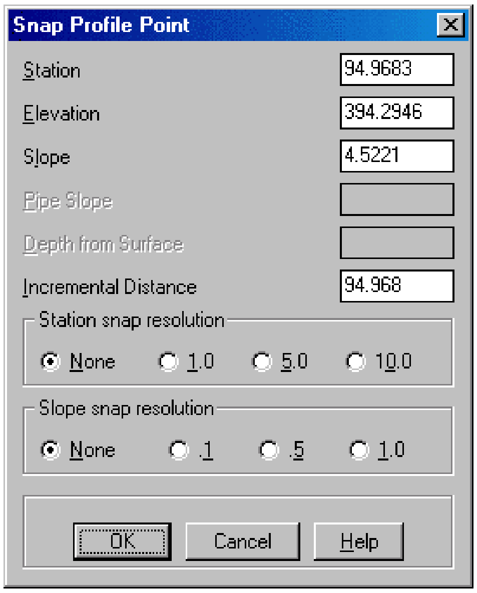
Profile Settings

Direction
● Left to Right ○ Right to Left

☑ Prompt for snap ☐ PVI 'V'

Grid Starting Station: 0
Grid Bottom Elevation: 390
Horizontal Scale: 100
Vertical Scale: 10
Profile Layer: 0

New or Append Profile File
● New ○ Append



Snap Profile Point

Station: 94.9683
Elevation: 394.2946
Slope: 4.5221
Pipe Slope:
Depth from Surface:
Incremental Distance: 94.968

Station snap resolution
● None ○ 1.0 ○ 5.0 ○ 10.0

Slope snap resolution
● None ○ .1 ○ .5 ○ 1.0

For Crest with Sight Distance>VC and Vertical Curve => 100.00

Sight Distance => 87.30, K-value => 44.1

Use these values (<Y>/N)? *Press Enter*

Station of next PVI or pick a point ('U' to Undo, Enter to End): *press Enter*

Vertical Curve Text Options dialog box

Pick vertical position for VC text: *Pick a position above the profile grid.*

Prerequisite: A profile grid

Keyboard Command: road

Design Sewer Profile

This command creates a sewer profile (.PRO) file and draws it on the screen. It requires that a grid is already drawn. It begins with the Profile Sewer Settings dialog box.

Prompts

Bottom Manhole Width: Specify the size for the bottom of manholes. Not available when Profile Type is set to pipe.

Max Pipe Length: Specify the maximum limit for the distance between manholes.

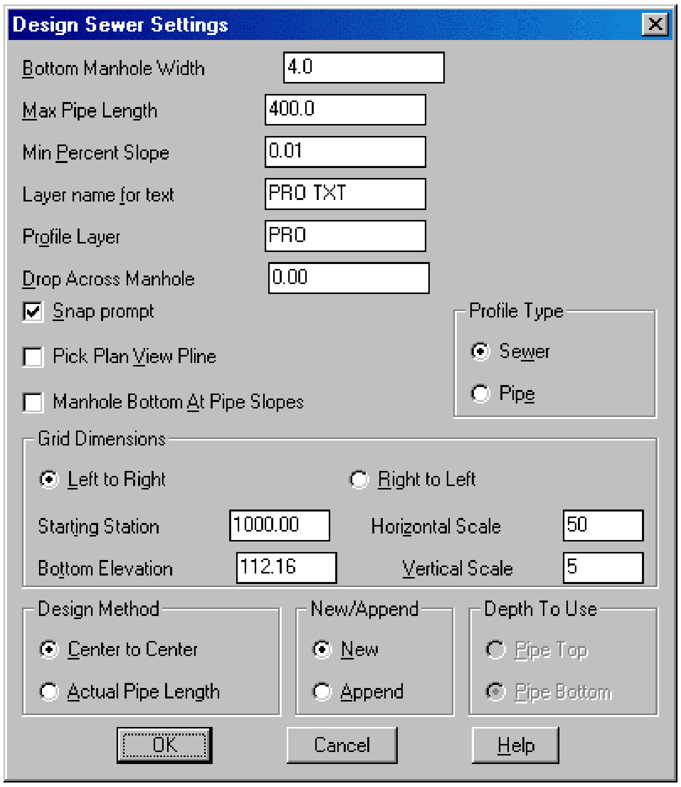
Min Percent Slope: Specify the minimum slope (absolute value) between manholes.

Layer name for text: Specify the layer name for annotation. If you enter a layer that does not exist, it will be created.

Profile Layer: Specify the layer name for pipes and manholes. If you enter a layer that does not exist, it will be created.

Drop Across Manhole: Specify the amount the elevation drop across the manhole in the direction of the profile. Will accept a negative a value. Not available when Profile Type is set to pipe.

Snap Prompt: Activates the PVI Snap dialog box. See below for description.



Design Sewer Settings

Bottom Manhole Width: 4.0

Max Pipe Length: 400.0

Min Percent Slope: 0.01

Layer name for text: PRO TXT

Profile Layer: PRO

Drop Across Manhole: 0.00

☑ Snap prompt

☐ Pick Plan View Pline

☐ Manhole Bottom At Pipe Slopes

Profile Type: ● Sewer ○ Pipe

Grid Dimensions: ● Left to Right ○ Right to Left

Starting Station: 1000.00

Horizontal Scale: 50

Bottom Elevation: 112.16

Vertical Scale: 5

Design Method: ● Center to Center ○ Actual Pipe Length

New/Append: ● New ○ Append

Depth To Use: ○ Pipe Top ● Pipe Bottom

Pick Plan View Polyline: Allows you to select a polyline from plan view that represents the sewer centerline.

Manhole Bottom At Pipe Slopes: When checked, the manhole bottom will be drawn level with the pipe slope.

Profile Type: Choose between Sewer profile or Pipe profile. Pipe profile do not include manholes.

Grid Dimensions: Specify the grid dimensions on which the sewer will be designed.

Design Method: Choose whether distances specified are center or manhole to center of manhole or actual pipe length. Not available when Profile Type is set to pipe.

New/Append: Choose between creating a new profile (.PRO) file or appending an existing file.

Depth to Use: Choose between specifying pipe top or pipe bottom elevations. Not available when Profile Type is set to sewer.

File Selection dialog

Choose a new profile file name to create.

Pick Lower Left Grid Corner <5000.0,5000.0>[endp on]: *Pick the corner*

Select existing ground polyline or ENTER for none: *You may optionally pick a polyline to use for calculating the depth from the surface as the sewer stations are entered.*

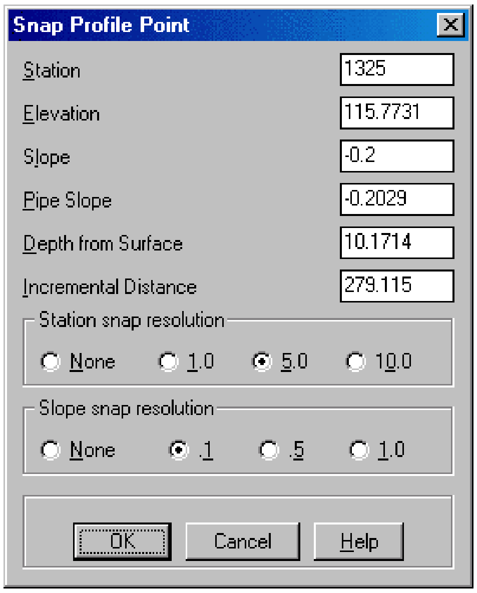
Station of first manhole or pick point: *0*

Invert Elevation of Manhole: *910*

Enter the step up/down in feet <0.00>: *Press Enter*

Station of second manhole or pick a point (U,E,D,Help): *pick a point*

If the Prompt for Snap option was selected in the main dialog, then the Snap Profile Point dialog appears here. The station and slope may be changed to the nearest snap value. The elevation is the free variable and it will change to compensate for any snap. To change the elevation, select the elevation edit box and enter the new value.



Snap Profile Point

Station: 1325

Elevation: 115.7731

Slope: -0.2

Pipe Slope: -0.2029

Depth from Surface: 10.1714

Incremental Distance: 279.115

Station snap resolution: ○ None ○ 1.0 ● 5.0 ○ 10.0

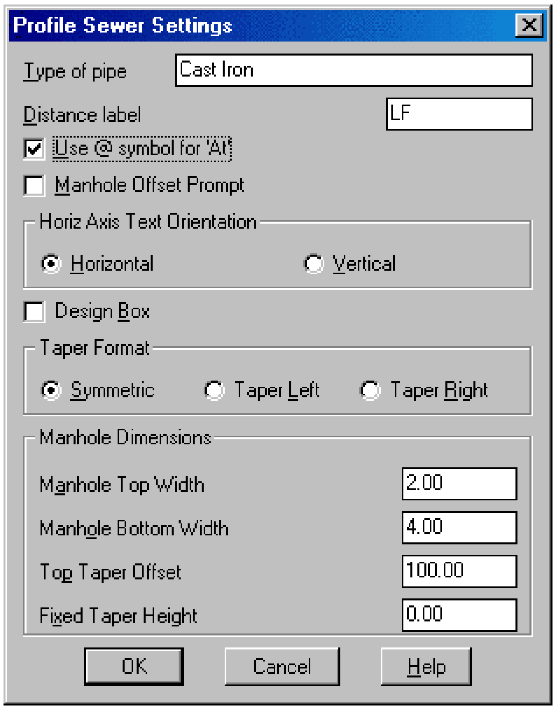
Slope snap resolution: ○ None ● .1 ○ .5 ○ 1.0

Enter the step up/down in feet <0.00>: *Press Enter*

Size of pipe in inches <10.0>: *8.0*
Station of next manhole or pick a point (U,E,D,Help): *Press Enter*

Profile Sewer Settings dialog

Sewer Label Options dialog



Profile Sewer Settings

Type of pipe: Cast Iron

Distance label: LF

☑ Use @ symbol for 'At'

☐ Manhole Offset Prompt

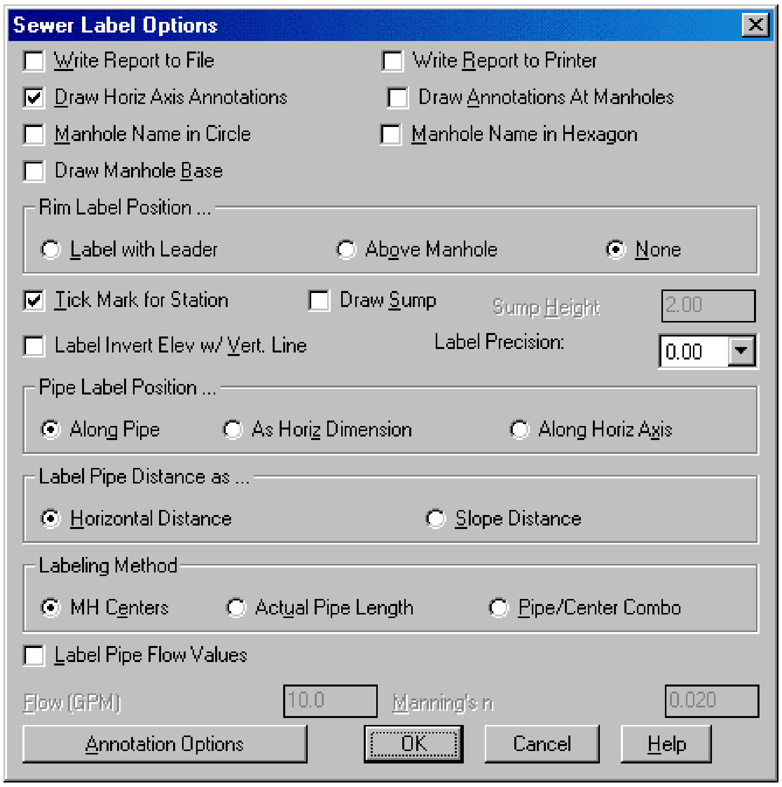
Horiz Axis Text Orientation
- ● Horizontal
- ○ Vertical

☐ Design Box

Taper Format
- ● Symmetric
- ○ Taper Left
- ○ Taper Right

Manhole Dimensions
- Manhole Top Width: 2.00
- Manhole Bottom Width: 4.00
- Top Taper Offset: 100.00
- Fixed Taper Height: 0.00

OK | Cancel | Help



Sewer Label Options

☐ Write Report to File | ☐ Write Report to Printer

☑ Draw Horiz Axis Annotations | ☐ Draw Annotations At Manholes

☐ Manhole Name in Circle | ☐ Manhole Name in Hexagon

☐ Draw Manhole Base

Rim Label Position ...
- ○ Label with Leader
- ○ Above Manhole
- ● None

☑ Tick Mark for Station | ☐ Draw Sump | Sump Height: 2.00

☐ Label Invert Elev w/ Vert. Line | Label Precision: 0.00

Pipe Label Position ...
- ● Along Pipe
- ○ As Horiz Dimension
- ○ Along Horiz Axis

Label Pipe Distance as ...
- ● Horizontal Distance
- ○ Slope Distance

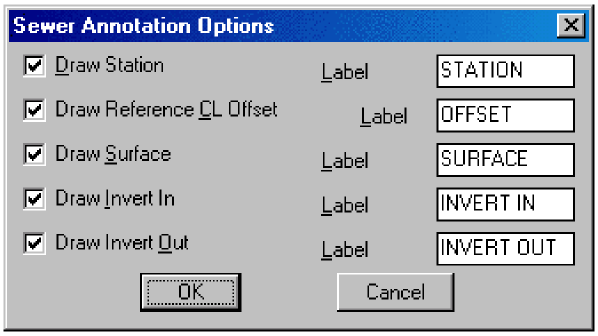
Labeling Method
- ● MH Centers
- ○ Actual Pipe Length
- ○ Pipe/Center Combo

☐ Label Pipe Flow Values

Flow (GPM): 10.0 | Manning's n: 0.020

Annotation Options | OK | Cancel | Help

Sewer Annotation Options dialog (displayed by pressing the Annotation Options button)



☑ Draw Station — Label: STATION

☑ Draw Reference CL Offset — Label: OFFSET

☑ Draw Surface — Label: SURFACE

☑ Draw Invert In — Label: INVERT IN

☑ Draw Invert Out — Label: INVERT OUT

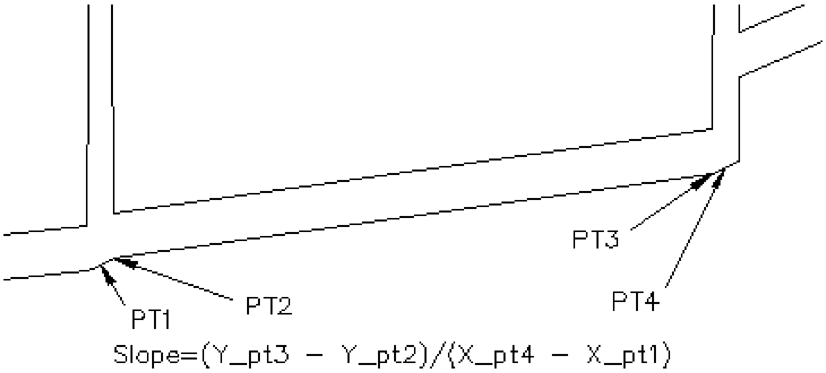
Select existing ground polyline: *Pick a polyline or press Enter to be prompted for each manhole surface elevation.* This prompt only appears if no ground polyline was selected above.

Manhole No. 1 label [MH #1]: *Press Enter*

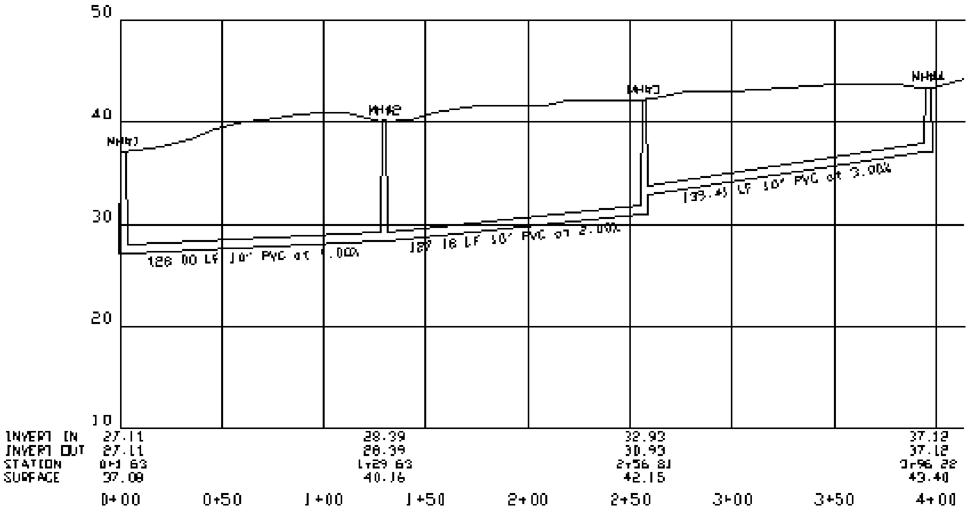
Manhole No. 2 label [MH #2]: *Press Enter*

Prerequisite: A profile grid

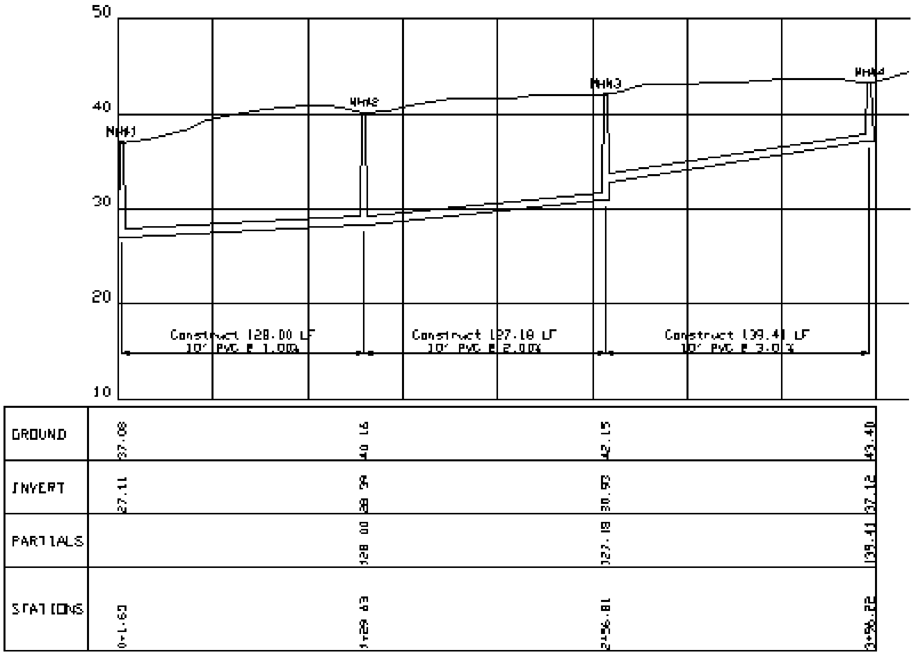
Keyboard Command: sewer



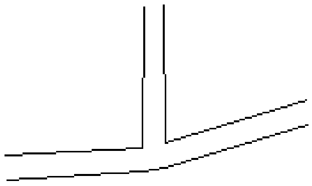
Pipe/Center Combo Labeling Method calculates the slope as the elevation difference from the edge of the pipe divided by the distance between the manhole centers.

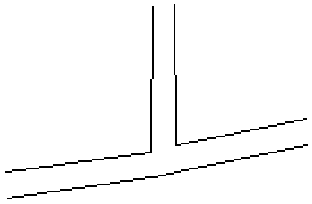


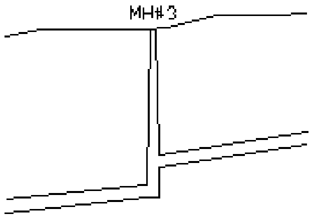
Example of sewer profile and surface profile


50
40
30
20
10
MH#1
MH#2
MH#3
MH#4
Construct 128.00 LF
10' PVC @ 1.00%
Construct 127.18 LF
10' PVC @ 2.00%
Construct 139.41 LF
10' PVC @ 3.01%
GROUND
37.08
40.16
42.15
43.40
INVERT
27.11
28.94
30.93
37.12
PARTIALS
128.00
127.18
139.41
STATIONS
0+1.63
1+29.63
2+56.81
3+96.22

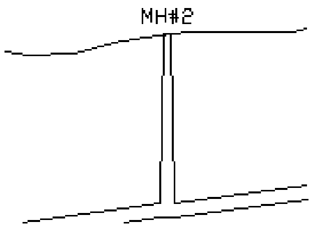
Example of sewer profile using Horizontal Axis Text Orientation as Vertical and Pipe Label Position as Horizontal Dimension

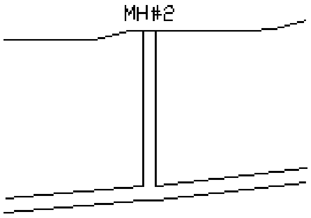


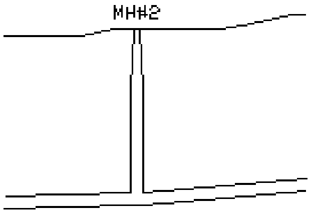




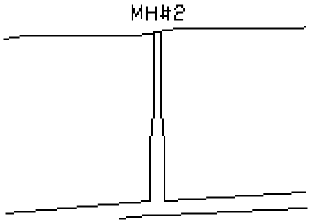
Detail of manhole bottom at pipe slope
Detail of drop across manhole of 0.2
Detail of step up

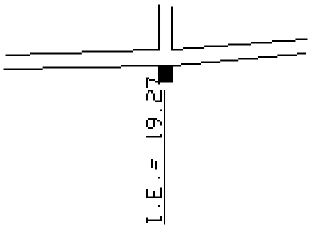


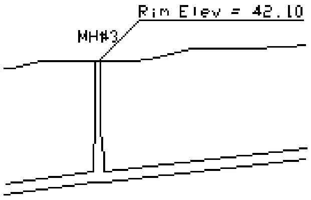




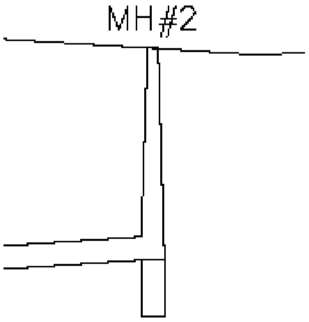
Top=2, Bottom=4, Offset=4, Fixed=0
Top=2, Bottom=4, Offset=100
Top=4, Bottom=4

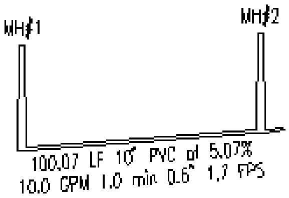





Rim Elev = 42.10
MH#3

Detail of Label Rim Elevation at Manhole
Top=2, Bottom=4, Offset=4, Fixed=2
Detail of Draw Manhole Base and Label Invert Elevation with Vertical Line

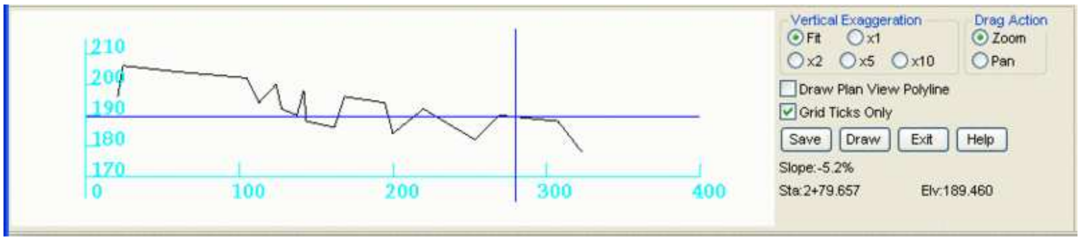




Label Pipe Flow Values option shows flow rate, travel time, depth and velocity
Manhole with the Draw Sump option

Quick Profile from Screen Entities

This command allows you to create, view, and draw profiles from the current surface.



Vertical Exaggeration: ● Fit ○ x1 ○ x2 ○ x5 ○ x10

Drag Action: ● Zoom ○ Pan

☐ Draw Plan View Polyline

☑ Grid Ticks Only

Slope:-5.2%

Sta:2+79.657 Elv:189.460

Pick starting point (CL-Centerline, P-Polyline): To make a profile you need to define the alignment by: 1) picking points on the screen; 2) typing in CL in the command prompt, and selecting a centerline file; or 3) typing in P and choosing a polyline from the screen. After doing so, the above profile viewer is created.

Quick Profile from Screen Entities creates a profile from all the entities that cross your alignment. When you move the cursor around the profile viewer a crosshair follows along the surface and reports the Station, Slope %, and Elevation at each point. It is displayed towards the bottom-right side of the screen. In this example the station is 2+79.657, the Slope is -5.2%, and the Elevation is 819.460. A crosshair can been seen in the profile drawing and along the alignment in the main drawing as well.

Vertical Exaggeration: x1 is the actual appearance of the surface(s). Depending on the flatness of the surface(s), you can select x2, x5, x10 vertical exaggerations to better see the elevation differentiation and different surfaces. The option Fit automatically exaggerates the vertical to best fit the profile viewer.

Drag Action: This dialog allows you to zoom in and out, and pan around the profile. To zoom in click and drag up, to zoom out click and drag down. To Pan, click amd drag the direction you want to move.

If you created a profile alignment by picking points and you want to save that polyline you created then toggle on Draw Plan View Polyline. If you do not choose Draw Plan View Polyline than the polyline will be lost when you exit out of the Quick Profile from Screen Enities command. Grid Ticks Only marks elevations and distances but does not draw them into grids.

The Save icon allows you to save the profile as a (.pro) file by whatever name you give it. The Draw icon allows you to draw the profile right on your drawing. Set the layer name, vertical and horizontal scale as desired, pick a starting point to draw, and the profile is created.

Prompts

Command: *tk_quickpro2*

Pick starting point (CL-Centerline,P-Polyline): *P to select a polyline from the screen*

Select profile centerline polyline: *Select the desired polyline*
Tested 39 of 39 Entities Intersects found> 12

Opening file C:/Program Files/Carlson TakeOff 2004/quickpro.pro for write.

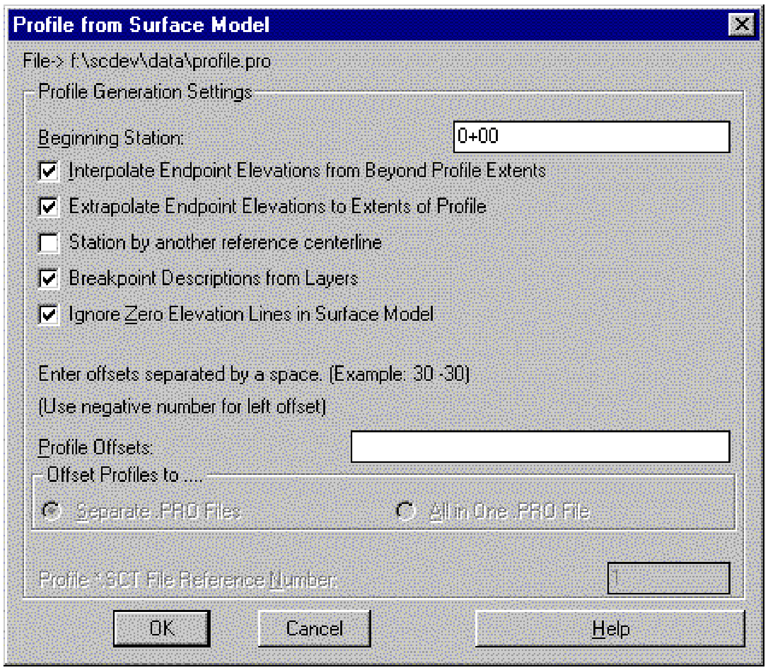
Prerequisite: entities

Keyboard Command: tk_quickpro2

Profile from Screen Entities

Profile from Surface Entities creates a profile from contours, triangular mesh, and other 3D drawing entities. The method is to draw a polyline as the profile centerline. Then the profile is derived from the intersections of this polyline with the 3D entities. For added accuracy in pulling the profile, include the triangular mesh as well as the contours.

The Interpolate Endpoint Elevations from Beyond Profile Extents option will cause the program to look past the ends of the centerline for additional intersections with 3D entities.These additional intersections will then be used to interpolate the elevation at the starting and ending station of the centerline. The Station by Another Reference Centerline option will prompt you to pick another centerline polyline. The intersection points along the first centerline are then projected onto the second centerline. The profile then stores the elevation of the intersection with the station along the second centerline.



Profile from Surface Model

File-> f:\scdev\data\profile.pro

Profile Generation Settings

Beginning Station: 0+00

☑ Interpolate Endpoint Elevations from Beyond Profile Extents

☑ Extrapolate Endpoint Elevations to Extents of Profile

☐ Station by another reference centerline

☑ Breakpoint Descriptions from Layers

☑ Ignore Zero Elevation Lines in Surface Model

Enter offsets separated by a space. (Example: 30 -30)
(Use negative number for left offset)

Profile Offsets:

Offset Profiles to ....

● Separate .PRO Files ○ All in One .PRO File

Profile *.SCT File Reference Number:

In addition to creating the one centerline profile, offset profiles may also be created by entering the offset distances in the Profiles Offset box of the Profile from Surface Model dialog.

Prompts

File Selection Dialog

Specify a profile file name to create.

Profile from Surface Model dialog box (previous page)

Polyline should be drawn in direction of increasing stations.

CL File/<select polyline which represents the profile centerline>: *Pick the centerline*

Select Lines, PLines, and/or 3DFaces that define the surface for profiling.

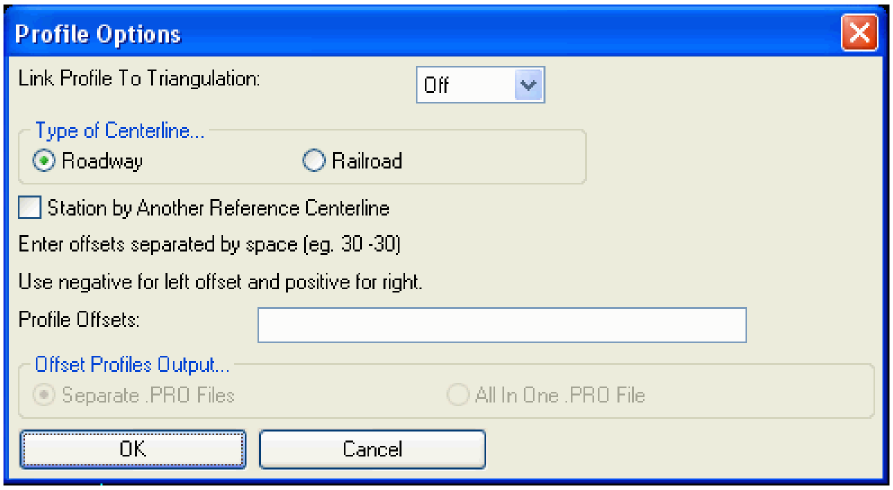
Select objects: *C* (for crossing and window everything the centerline crosses)

Prerequisite: A polyline centerline and surface lines and polylines.

Profile from TIN or Grid

This command creates a profile (.PRO file) from a centerline polyline and a surface model stored in a 3D grid file (.GRD) or triangulation file (.TIN or .FLT). The polyline defines the alignment of the profile and the grid defines the surface.

After selecting the reference surface file, there is a Profile Options dialog with these options:
Link Profile To Triangulation: This option will update the profile whenever the reference triangulation is modified.
Type of Centerline: This setting chooses the type of stationing for centerline curves.
Station by Another Reference Centerline: This option uses a second reference centerline for the stationing of the profile. The main centerline is used to find the elevations on the surface and then these main centerline positions are projected onto the reference centerline to get the stationing. The reference centerline needs to extend along the full range of the picked polyline in order to project correctly and capture offsets along the entire length of the picked centerline.
Profile Offsets: In addition to creating the profile along the centerline, you can also create profiles offset left and right.



Link Profile To Triangulation: Off

Type of Centerline...
● Roadway ○ Railroad

☐ Station by Another Reference Centerline

Enter offsets separated by space (eg. 30 -30)

Use negative for left offset and positive for right.

Profile Offsets:

Offset Profiles Output...
● Separate .PRO Files ○ All In One .PRO File

Prompts

Choose Grid or Triangulation file to process Select existing .GRD, .TIN, or .FLT file.
Profile Options dialog.
Choose PROfile file to Write dialog Enter a profile file (.PRO) name to write.
Polyline should have been drawn in direction of increasing stations.
CL File/<Select polyline that represents centerline>: *select a polyline*
Polyline should have been drawn in direction of increasing stations.
CL File/<Select Reference centerline polyline>: *select a polyline*
CL File/<Select Reference centerline polyline>: *press Enter*
Reference CL starting station <0.0>: *press enter*

Pulldown Menu Location: Profiles > Create Profile From ...
Keyboard Command: progrid
Prerequisite: A .GRD grid file, .TIN, or .FLT tmesh file

Profile from 2D Polyline

This command allows you to convert a polyline that is drawn on a profile grid into a profile (.PRO) file. The polyline must be drawn in the direction of stationing.

Prompts

New or Append Dialog Box

Choose New unless you intend to create a multiple profile.

File Selection Dialog Box

Specify the profile (.PRO) file to create.

Profile Settings Dialog

Set these parameters to match the dimensions of the grid.

Pick the lower left grid corner: *Pick the grid corner.* Endpoint snap is set on.

Profile number <1>: *Press Enter.* This is an optional profile name used for multiple profiles.

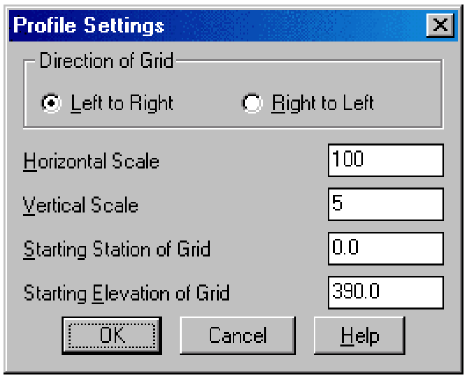
Select the polyline to write profile from:

Select object: *Pick the polyline in the grid.*

A station and elevation report is produced.

Prerequisite: Drawn polyline which represents profile.

Keyboard Command: pro2dpl



Profile Settings

Direction of Grid

● Left to Right ○ Right to Left

Horizontal Scale: 100

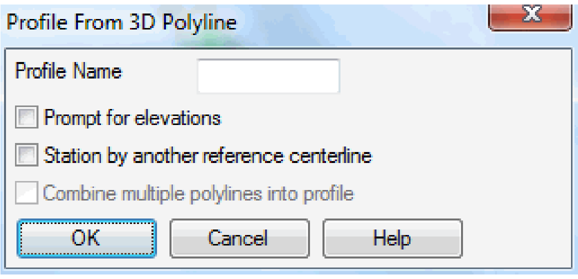
Vertical Scale: 5

Starting Station of Grid: 0.0

Starting Elevation of Grid: 390.0

Profile from 3D Polyline

To create a profile (.PRO), Profile from 3D Polyline uses X-Y distances between the points of a 3D polyline for sequential stations and the Z values at these points for profile elevations. In the options dialog, Profile Name is an optional description for the profile. The Prompt For Elevations option will prompt for the elevation at each polyline vertex to use for the profile instead of using the polyline elevations. The Station By Another Reference Centerline method locates the station for each polyline vertex along a reference centerline and uses this reference station instead of the polyline distance for the profile stationing. The reference centerline can be defined by another polyline or centerline file (.CL). When using the reference centerline, the Combine Multiple Polylines Into Profile option allows you to select multiple 3D polylines and put the data into a single profile. For example, you can use these two options to create a profile of curb elevations with road centerline stationing by selecting multiple 3D curb polylines and the road centerline as the stationing reference.


Profile From 3D Polyline
Profile Name
☐ Prompt for elevations
☐ Station by another reference centerline
☐ Combine multiple polylines into profile
OK
Cancel
Help

After the options dialog, the program prompts for the .PRO file to create and then the 3D polyline to process.

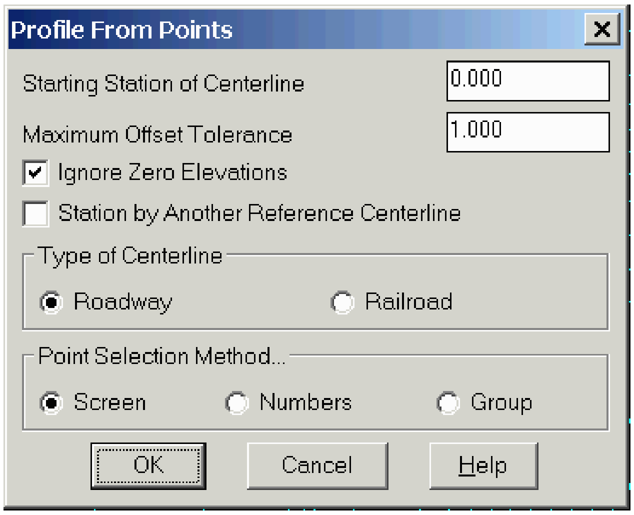
Prompts

Profile From 3D Polyline dialog
Profile File to Write dialog Specify a profile file name to create
Select polyline to profile: *pick a 3D polyline*
Created 72 data points for profile C:\sample\abc.pro
The new profile is then stored.

Pulldown Menu Location: Profiles
Keyboard Command: pro3dpl
Prerequisite: A 3D polyline

Profile from Points on Centerline

This command creates a .PRO file from points and a centerline that is represented by a polyline or centerline file. The elevations of the profile are derived from the elevation of the points and the stationing for these profile points is calculated from the distance along the centerline. The points must be within the offset distance from the polyline in order to be included in the profile. The profile is created by projecting the points perpendicular onto the alignment to determine the station and the elevation comes from the point elevation. The polyline or centerline should be drawn (or defined) in the direction of increasing stations. The points can be selected from point entities in the drawing (Screen), by point numbers from the current coordinate file (Numbers), or by point group as defined by the Point Group Manager (Group).



Starting Station of Centerline: 0.000

Maximum Offset Tolerance: 1.000

☑ Ignore Zero Elevations

☐ Station by Another Reference Centerline

Type of Centerline: ● Roadway ○ Railroad

Point Selection Method...: ● Screen ○ Numbers ○ Group

Prompts

PROfile file to Write dialog box: Enter a new profile file name to write.
CL File/<Select polyline that represents centerline>: *pick a polyline or choose C for Centerline*
Select Centerline file if Centerline option is used. If the desired points are further from the centerline, enter a larger maximum offset tolerance.
Note: for all selected points, the points should be located on the real Z axis.
Select the Carlson points along the centerline.
Select objects: Select the point entities.

Keyboard Command: profpts
Prerequisite: A polyline centerline and points

Import Profile

This command converts Terramodel, Geodimeter, GeoPak, Sokkia/Leitz, Softdesk, and Leica road files into Carlson TakeOff profile (.PRO) files.

Prerequisite: a Terramodel, Geodimeter, GeoPak, Sokkia/Leitz, Softdesk, or Leica road file

Profile To 3D Polyline

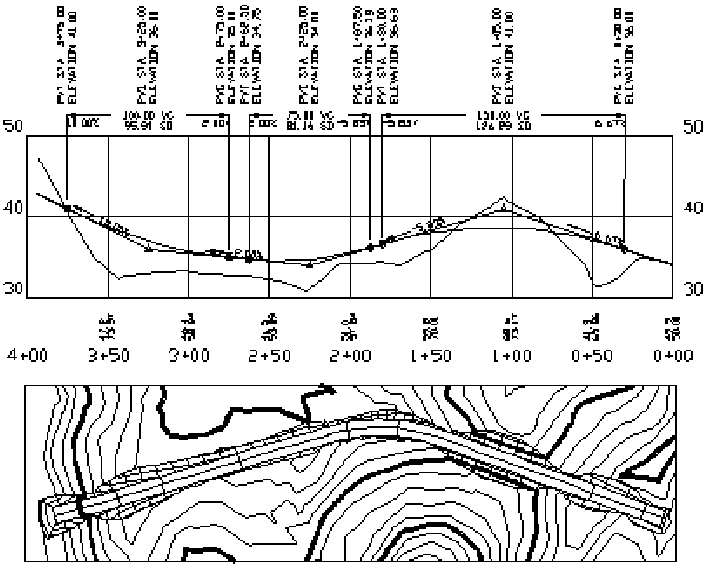
This command converts a 2D polyline centerline into a 3D polyline that follows the elevations of the profile. Horizontal and vertical curves are represented as a series of polyline segments since 3D polylines cannot contain arcs. Profile to 3D Polyline can be combined with other commands for plan-view road design as follows:

1. Draw 2D polyline centerline.
2. Profile from Surface Model - to create existing surface profile.
3. Design Road Profile - to design the final profile with vertical curves.
4. Profile to 3D Polyline - create a 3D polyline of the road centerline.
5. Offset 3D Polyline - offset the 3D polyline centerline left and right by the horizontal and vertical distances.
6. Design Pad Template - run twice for left and right polylines of road to tie into surface at specified cut and fill slopes. This creates the limits of the disturbed area. Or use Join Nearest, Direct Connect Endpoints, to create a closed loop pad with one run of Design Pad Template for simple ramps, driveways and access roads.

7. Triangulate & Contour - draw final contours using road 3D polylines.
8. Volumes - use any of the volumes commands to calculate cut and fill volumes.

Prompts

Layer Name for 3D Polyline <3DPROF>: *press Enter*
Select profile centerline polyline: *pick a polyline*
Station by another reference centerline [Yes/<No>]? *N* for no. This option will prompt for a second centerline to use for stationing.
Enter the starting station <0.0>: *press Enter*
Select Profile File
Starting station of centerline <0.0>: *press Enter*
Erase centerline (Yes/<No>)? *Y* This option will erase the original 2D polyline centerline.

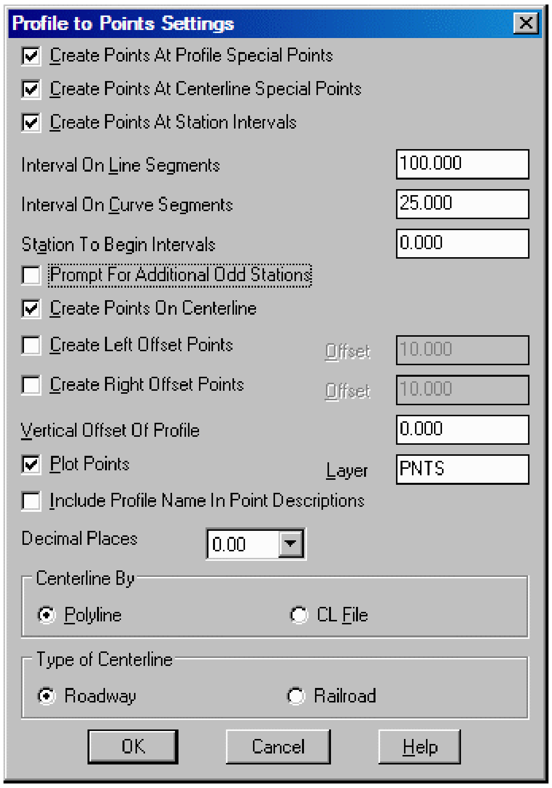


Example of road design in plan-view with Profile to 3D Polyline

Keyboard Command: proto3dp
Prerequisite: A .PRO file and a centerline polyline

Profile To Points

This command creates Carlson points along a horizontal alignment polyline using a profile file to compute the point elevations. The created points are stored in a coordinate (.CRD) file and can also be drawn on screen in the layer specified by the user. Station text, profile name, and special points (vertical and horizontal PC's and PT's) can be stored in the point description depending on user settings.


Profile to Points Settings

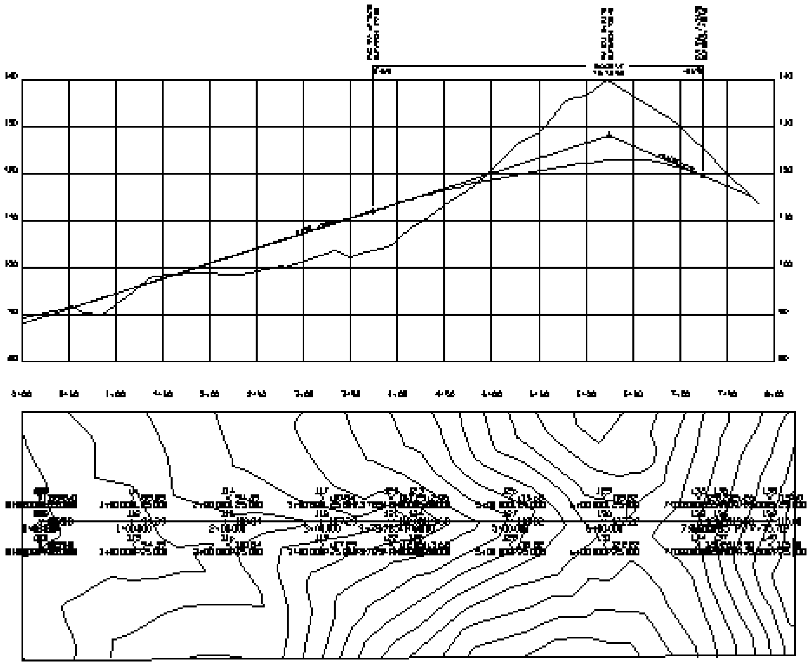
☑ Create Points At Profile Special Points
☑ Create Points At Centerline Special Points
☑ Create Points At Station Intervals
Interval On Line Segments: 100.000
Interval On Curve Segments: 25.000
Station To Begin Intervals: 0.000
☐ Prompt For Additional Odd Stations
☑ Create Points On Centerline
☐ Create Left Offset Points — Offset: 10.000
☐ Create Right Offset Points — Offset: 10.000
Vertical Offset Of Profile: 0.000
☑ Plot Points — Layer: PNTS
☐ Include Profile Name In Point Descriptions
Decimal Places: 0.00
Centerline By: ● Polyline ○ CL File
Type of Centerline: ● Roadway ○ Railroad

Create points at Profile special points: Includes vertical PC and PT points.
Create points at Centerline special points: Includes horizontal PC and PT points.
Create points at Station Intervals: Allows you to specify intervals for point creation.
Interval On Line Segments: Specify station interval for line segments.
Interval On Curve Segments: Specify station interval for curve segments.
Station to Begin Intervals: Specify station to start intervals.
Prompt For Additional Odd Stations: Any station can be entered to create additional points with elevations derived from the profile.
Create Points on Centerline: When checked, points will be created on the centerline.
Create Left Offset Points: When checked, left offset points will be created. Specify the offset in the edit box.
Create Right Offset Points: When checked, right offset points will be created. Specify the offset in the edit box.
Vertical Offset of Profile: Specify the vertical offset. Enter zero for no vertical offset.
Plot Points: When checked, points will be plotted in the drawing, otherwise points are only added to the current coordinate (.CRD) file.
Include profile name in point descriptions: When checked, the profile name will be used as the prefix on the point description. For example, if the profile name is DESIGN.PRO, then the point description might be DESIGN 0+63.37.
Decimal Places: Specify the display precision for points that are plotted in the drawing. This setting does not affect the coordinates stored in the CRD file.
Centerline by: Click either Polyline or CL File.
Type of Centerline: Click either Roadway or Railroad.
OK: Specify files.

Prompts

Select Coordinate File to Process
If the current coordinate is set, it is used automatically without this prompt.
Select profile centerline polyline: *pick a polyline*
Starting station of centerline <0.0>: *press Enter*
Station by another reference centerline [Yes/<No>]? *N for no*. This option will prompt for a second centerline to use for stationing. With this option, the first centerline is used for locating the points and the second reference

centerline is used for locating the profile stations. So the first centerline represents where the points are created (ie. the edge of pavement) and the second centerline represents the profile location (ie. the road CL).
Choose Profile to Process dialog Specify a profile name.
Starting point number <1>: *press Enter* This defaults to the point number after the highest one currently in the CRD file.
Station for additional point (ENTER to end): *press Enter* This option will create a point at the specified station. Prompt occurs only if option is specified in dialog.



Points created along profile centerline using elevations from the above road profile

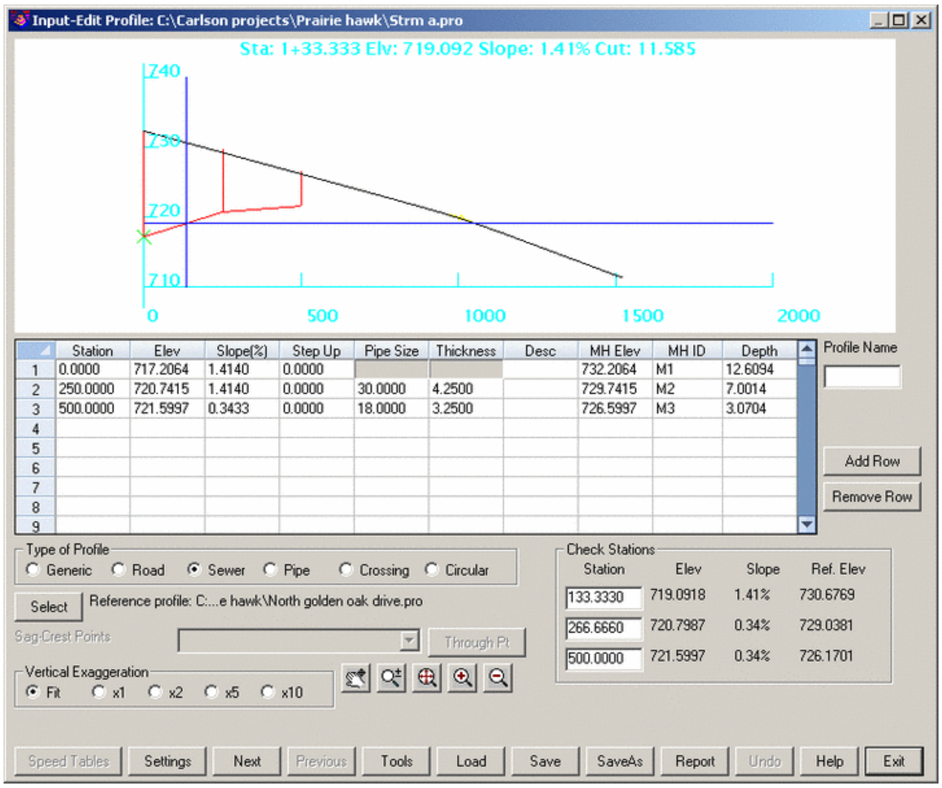
Keyboard Command: pro2pts
Prerequisite: A .PRO file and a centerline polyline

Input-Edit Profile File

Similar to the Input-Edit Road Profile command, this command features a spreadsheet type editor and handles a variety of profile (.PRO) configurations. Besides editing a profile, this routine can be used to just view the contents of a profile.

The command starts by prompting for the profile file to edit. Alternately, you can run Input-Edit Profile by double-clicking on a profile polyline that is drawn on a profile grid.

The opening dialog below shows the layout of this editor. At the top of the dialog, you can dynamically see the profile and vary its appearance by using zoom and pan. The station, elevation and slopes are also shown at the lower left of the dialog which update/track with the movement of the cursor. There are between five and nine possible data fields in a profile depending on the type of profile that has been selected.



Sta: 1+33.333 Elv: 719.092 Slope: 1.41% Cut: 11.585

	Station	Elev	Slope(%)	Step Up	Pipe Size	Thickness	Desc	MH Elev	MH ID	Depth
1	0.0000	717.2064	1.4140	0.0000				732.2064	M1	12.6094
2	250.0000	720.7415	1.4140	0.0000	30.0000	4.2500		729.7415	M2	7.0014
3	500.0000	721.5997	0.3433	0.0000	18.0000	3.2500		726.5997	M3	3.0704
4										
5										
6										
7										
8										
9										

Type of Profile: ○ Generic ○ Road ● Sewer ○ Pipe ○ Crossing ○ Circular

Reference profile: C:...e hawk\North golden oak drive.pro

Sag-Crest Points

Vertical Exaggeration: ● Fit ○ x1 ○ x2 ○ x5 ○ x10

Check Stations

Station	Elev	Slope	Ref. Elev
133.3330	719.0918	1.41%	730.6769
266.6660	720.7987	0.34%	729.0381
500.0000	721.5997	0.34%	726.1701

Profile Name: This name is optional and often used when multiple profiles are stored in a profile (.PRO) file and graphically generated using the Draw Profile command.

Add Row: Adds a new row into the profile after the current row.

Remove Row: Removes the current row.

Type of Profile: There are 6 types of .pro files and the spreadsheet columns will change to match the data fields for the selected profile type:

- *Generic* - Generic profiles have station, elevation and description fields.
- *Road* - Road profiles include the Generic controls and adds a vertical curve field. For an asymmetrical vertical curve, enter the left and right side values separated by a dash in the spreadsheet cell. For example, a 200' vertical curve with 50' to the left of PVI and 150' to the right would be entered as "50-150".

- *Sewer* - Sewer profiles include the Generic controls and adds step up, pipe size, pipe thickness, manhole elevation and manhole ID fields.
- *Pipe* - Pipe profiles include the Generic controls and adds a pipe size field.
- *Crossing* - Crossing profiles are for pipe crossings along the centerline. Besides station and elevation, the crossing data points also have the pipe size. The crossing elevation is for the bottom elevation of the pipe. The crossing profile data points are not connected.
- *Circular* - Circular profiles are the same as Road profiles except the vertical curve is circular instead of parabolic.

Edit Slope To Change: This setting controls which field to update when the slope is modified in the spreadsheet.

Reference Profile Select: Selects a reference profile and displays it in the profile graphic view immediately.

Sag-Crest Points: When editing a road profile, its sag/crest points are shown here.

Through Pt: This button lets user to make the road profile pass through a certain point.

Vertical Exaggeration: Changes the look of the profile.

Check Stations: Reports profile information at the specified stations. The Check Stations are not stored in the profile; they are merely used as a design/analysis tool for viewing the elevations at certain stations while adjusting the profile data.

Speed Tables: This button is enabled only when you edit a road profile. Please refer to the documentation on Input-Edit Road Profile for the information on Vertical Speed Tables.

Next: Used for navigation when editing a .PRO file containing multiple profiles, loads the next profile.

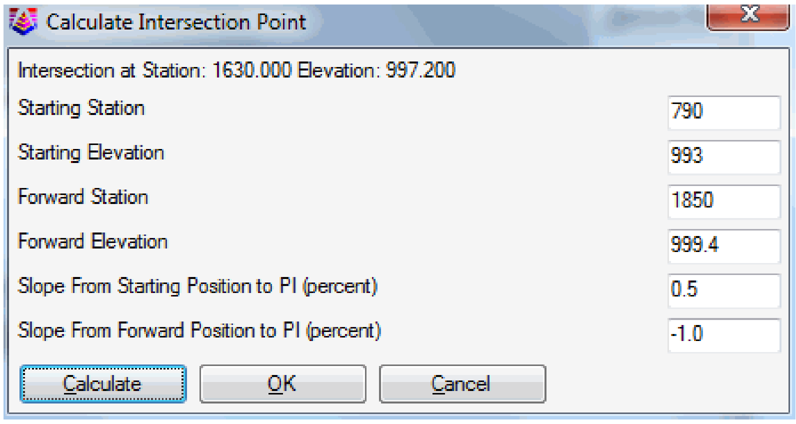
Previous: Used for navigation when editing a .PRO file containing multiple profiles, loads the previous profile.

Load: Used for loading another, existing .PRO file for editing.

Save: Saves the profile using the current profile file name. The current profile file name is displayed in the top title bar of the dialog box.

SaveAs: Allows you to save the profile under a different profile file name.

Calc PI: This function calculates a station/elevation point given two existing station/elevation points and slopes from them. The values are entered in this dialog. When you pick Calculate, the program finds the intersection of the grade lines. Then pick OK and the calculated PVI is added to the profile.



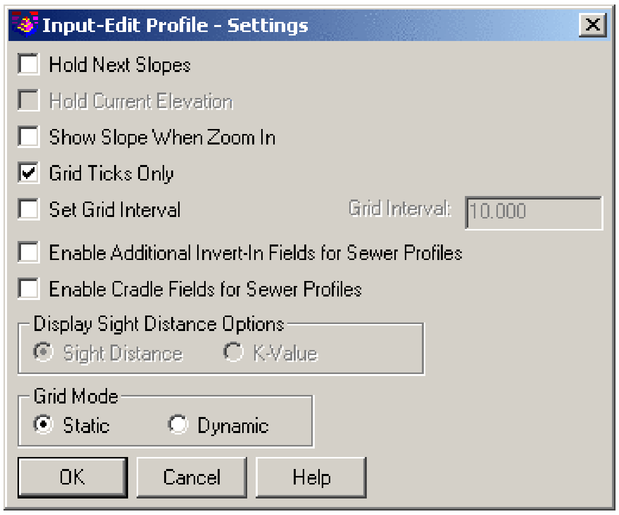
Intersection at Station: 1630.000 Elevation: 997.200

Starting Station	790
Starting Elevation	993
Forward Station	1850
Forward Elevation	999.4
Slope From Starting Position to PI (percent)	0.5
Slope From Forward Position to PI (percent)	-1.0

Report: Creates a report of current profile.

Undo: Reverts the last action in the editor.

Settings: Opens the settings dialog.



☐ Hold Next Slopes
☐ Hold Current Elevation
☐ Show Slope When Zoom In
☑ Grid Ticks Only
☐ Set Grid Interval Grid Interval: 10.000
☐ Enable Additional Invert-In Fields for Sewer Profiles
☐ Enable Cradle Fields for Sewer Profiles

Display Sight Distance Options
● Sight Distance ○ K-Value

Grid Mode
● Static ○ Dynamic

Hold Next Slopes: When editing a profile elevation, this option will maintain all the slopes after the edit point by adjusting the elevations. Otherwise, the elevations for the rest of the profile points are held and the slope from the edit profile point to the next profile point is adjusted.

Hold Current Elevation: When you change a PVI's station or elevation, if this toggle is on, its slope out will be changed and the elevation of the next PVI is held, otherwise its slope out is held and the elevation of the next PVI will be changed.

Use K-Value: Toggles between displaying K-Value and Sight Distance in the fifth column for road profiles.

Show Slope When Zoom In: This option allows to display the slopes on the long enough profile segments when zoom in.

Grid Ticks Only: Toggles between displaying the grid and grid ticks in the graphic box.

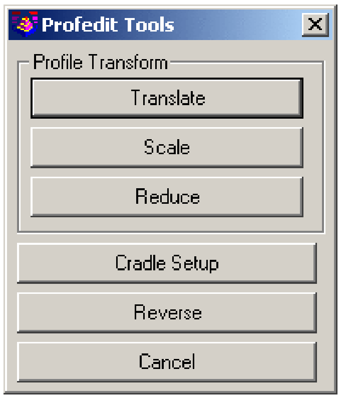
Set Grid Interval: This option allows you to control the elevation grid spacing in the graphic preview. When this option is off, the program automatically figures the elevation grid interval.

Enable Additional Invert-In Fields for Sewer Profiles: When editing a sewer profile, this option allows you to display an extra invert-in column for in-coming pipes. The invert-in elevations are separated by commas.

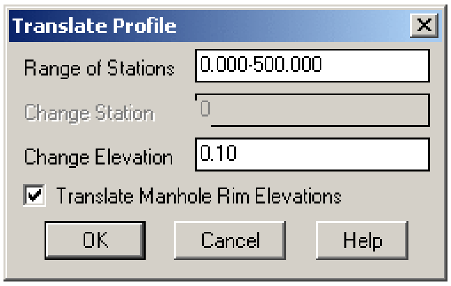
Enable Cradle Fields for Sewer Profiles: When editing a sewer profile, this option allows to display cradle above and cradle below columns.

Grid Mode: The **Dynamic** option will update the grid interval labels when you zoom in or out of the profile image. The **Static** option will keep the grid interval labels static.

Tools: Opens the Tools dialog.



Translate: Globally adds or subtracts value to stations and/or elevations within the specified range of stations. while Scale will apply the specified scale factor to stations and/or elevations within the specified range of stations.



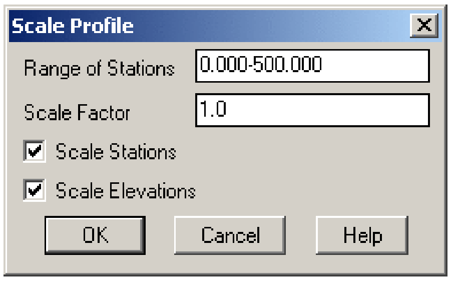
Range of Stations 0.000-500.000

Change Station 0

Change Elevation 0.10

☑ Translate Manhole Rim Elevations

Scale: Applies the specified scale factor to stations and/or elevations within the specified range of stations.



Scale Profile

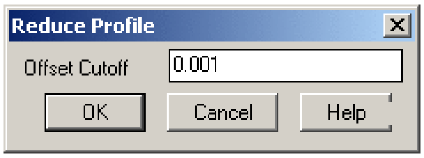
Range of Stations: 0.000-500.000

Scale Factor: 1.0

☑ Scale Stations

☑ Scale Elevations

Reduce: Reduces the profile points by the Offset Cutoff value.

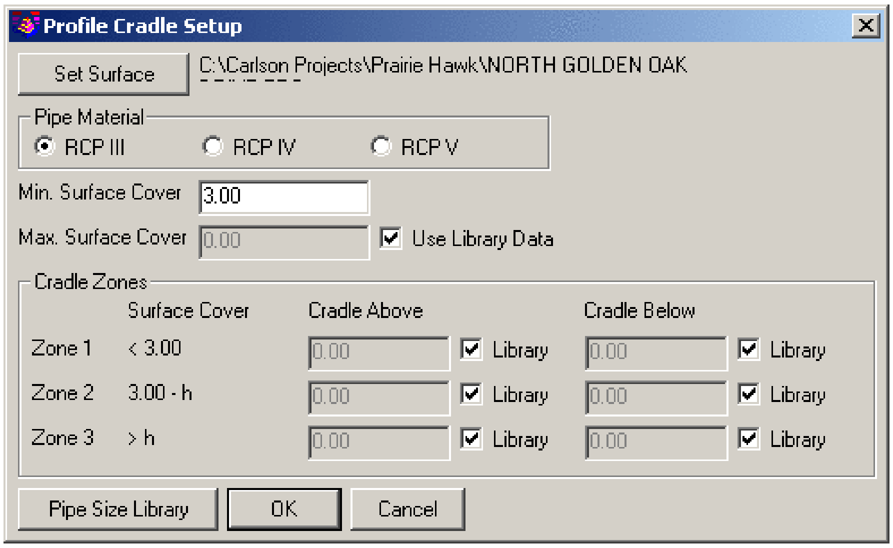


Reduce Profile

Offset Cutoff: 0.001

Reverse: Reverses the direction of the stationing for the profile.

Cradle Setup: Sets up the cradles for sewer profiles. The cradle parameters are different with different pipe sizes and are defined in the Pipe Size Library. You can either use library data or specify new values here.



Profile Cradle Setup

Set Surface: C:\Carlson Projects\Prairie Hawk\NORTH GOLDEN OAK

Pipe Material: ● RCP III ○ RCP IV ○ RCP V

Min. Surface Cover: 3.00

Max. Surface Cover: 0.00 ☑ Use Library Data

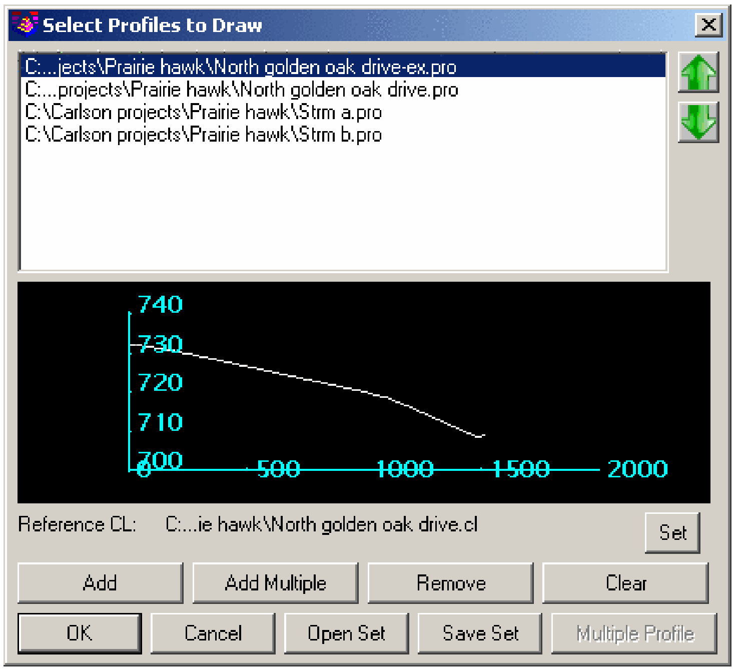
Cradle Zones

	Surface Cover	Cradle Above		Cradle Below	
Zone 1	< 3.00	0.00	☑ Library	0.00	☑ Library
Zone 2	3.00 - h	0.00	☑ Library	0.00	☑ Library
Zone 3	> h	0.00	☑ Library	0.00	☑ Library

Pulldown Menu Location: Profiles
Keyboard Command: profedit
Prerequisite: None

Draw Profile

Draw Profile is a flexible routine for drawing a profile anywhere in the drawing. The profile may be drawn with or without a grid or with just tick marks. The vertical curve annotations for a road profile and manhole annotations for a sewer profile, may also be drawn. Draw Profile uses the profile information that is stored in .PRO files. Once the profile is drawn using Draw Profile, the design and labeling routines of the Profiles dropdown are applicable to the profile. Please note, several of the options presented in the following dialogs will depend on the type of unit system being used, metric or english. Options such as text sizes, sheet dimensions, and scaling factors may vary from the examples shown here.

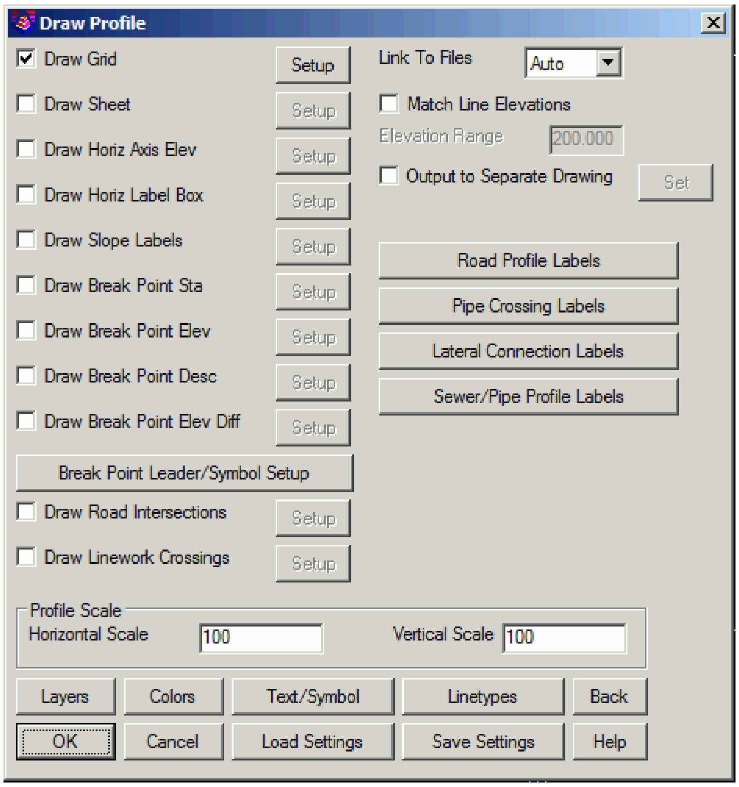

Select Profiles to Draw

C:...jects\Prairie hawk\North golden oak drive-ex.pro
C:...projects\Prairie hawk\North golden oak drive.pro
C:\Carlson projects\Prairie hawk\Strm a.pro
C:\Carlson projects\Prairie hawk\Strm b.pro

Reference CL: C:...ie hawk\North golden oak drive.cl

740
730
720
710
700
0
500
1000
1500
2000
Set
Add
Add Multiple
Remove
Clear
OK
Cancel
Open Set
Save Set
Multiple Profile

The first step in Draw Profile is to choose the profile (.PRO) file(s) you want to draw. The graphic window shows the highlighted profile in the list. The **Set** button allows you to indicate a "primary" centerline that is used as the basis for stationing when creating Plan & Profile sheets. **Add** and Remove buttons allow you to select more profile files to the list and remove the highlighted profile from the list. The **Clear** button removes all the profiles. When a highlighted profile file has multiple profiles, the **Multiple Profile** button is enabled, which opens a dialog for choose which profile to draw. The **Open Set** and **Save Set** buttons are used to load or store the profile selection to a .PST file. Click **OK** button to go to the next step. The Draw Profile dialog box appears, and contains all of the settings for creating the profile.


Draw Profile

☑ Draw Grid
☐ Draw Sheet
☐ Draw Horiz Axis Elev
☐ Draw Horiz Label Box
☐ Draw Slope Labels
☐ Draw Break Point Sta
☐ Draw Break Point Elev
☐ Draw Break Point Desc
☐ Draw Break Point Elev Diff
☐ Draw Road Intersections
☐ Draw Linework Crossings

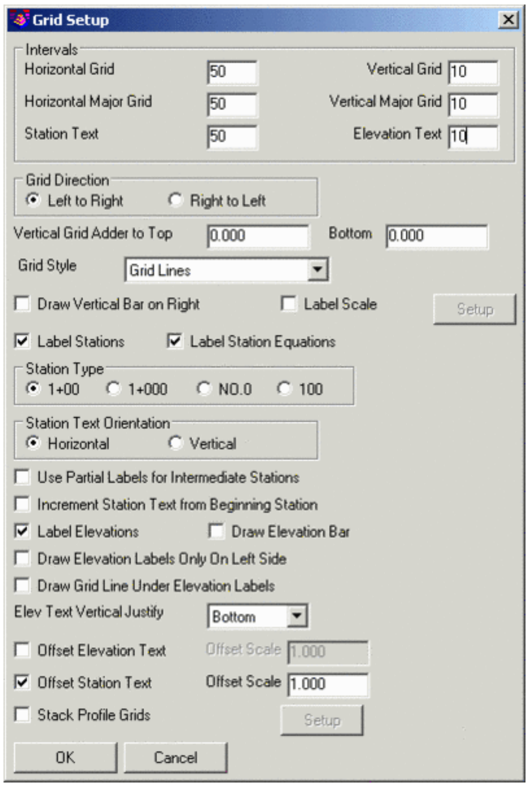
Link To Files: Auto
☐ Match Line Elevations
Elevation Range: 200.000
☐ Output to Separate Drawing

Profile Scale
Horizontal Scale: 100
Vertical Scale: 100

Setup
Set
Road Profile Labels
Pipe Crossing Labels
Lateral Connection Labels
Sewer/Pipe Profile Labels
Break Point Leader/Symbol Setup
Layers
Colors
Text/Symbol
Linetypes
Back
OK
Cancel
Load Settings
Save Settings
Help

Draw Grid

This option will draw a grid and axis elevations for the profile. Pick Setup to access Grid Setup dialog.



Grid Setup

Intervals
Horizontal Grid 50 Vertical Grid 10
Horizontal Major Grid 50 Vertical Major Grid 10
Station Text 50 Elevation Text 10

Grid Direction
● Left to Right ○ Right to Left

Vertical Grid Adder to Top 0.000 Bottom 0.000

Grid Style Grid Lines

☐ Draw Vertical Bar on Right ☐ Label Scale

☑ Label Stations ☑ Label Station Equations

Station Type
● 1+00 ○ 1+000 ○ NO.0 ○ 100

Station Text Orientation
● Horizontal ○ Vertical

☐ Use Partial Labels for Intermediate Stations

☐ Increment Station Text from Beginning Station

☑ Label Elevations ☐ Draw Elevation Bar

☐ Draw Elevation Labels Only On Left Side

☐ Draw Grid Line Under Elevation Labels

Elev Text Vertical Justify Bottom

☐ Offset Elevation Text Offset Scale 1.000

☑ Offset Station Text Offset Scale 1.000

☐ Stack Profile Grids

Horizontal Grid: Enter a value of how often grid lines should be displayed to coincide with the station values along the horizontal axis of the grid.

Horizontal Major Grid: Enter a value of how often major (or "heavy") grid lines should be displayed to coincide with the station values along the horizontal axis of the grid.

Station Text: Indicate how often station text labels should appear along the horizontal axis of the grid.

Vertical Grid: Enter a value of how often grid lines should be displayed to coincide with the elevation values along the vertical axis of the grid.

Vertical Major Grid: Enter a value of how often major (or "heavy") grid lines should be displayed to coincide with the elevation values along the vertical axis of the grid.

Elevation Text: Indicate how often elevation text labels should appear along the vertical axis of the grid.

Grid Direction: Profiles can be drawn Left to Right (the default) or Right to Left. Although most profiles are drawn left to right, if you have a road that runs East to West and you wish to draw the profile stationing beneath the actual road stationing, then choosing a Right to Left profile may be appropriate.

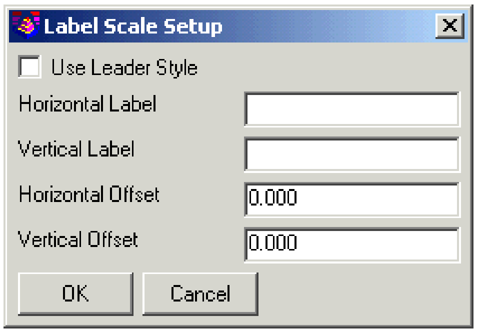
Vertical Grid Adder to Top: This adds the specified amount of grid to the top of the profile.

Bottom: This adds the specified amount of grid to the bottom of the profile.

Grid Style: This selects the type of Grid to generate. The choices are Grid Lines, Ticks Only, Ticks and Dots, Ticks and Checks.

Draw Vertical Bar on Right: This option places the vertical label bar on the right of the grid, as opposed to the left.

Label Scale: Click on this option and you obtain a scale drawn at the lower left corner of the profile. Click the **Setup** button to establish the desired Scale labels and placement values.



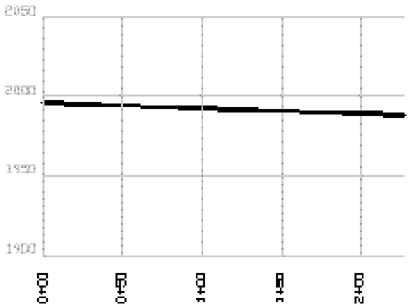
☐ Use Leader Style
Horizontal Label
Vertical Label
Horizontal Offset 0.000
Vertical Offset 0.000

Label Stations: Disable this option if you do not want station labels to be placed along the grid.

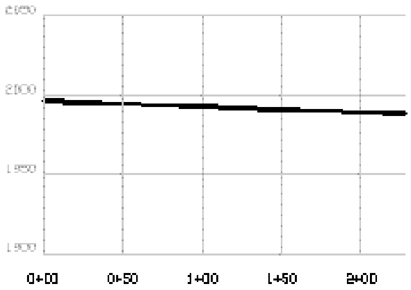
Label Station Equations: Disable this option if you do not want station equation labels to be placed along the grid.

Station Type: Indicated the preferred style of station formatting.

Station Text Orientation: This option allows you to specify the orientation of the station text shown along the bottom of the profile. The example below shows both options:



Station Text Orientation = Vertical



Station Text Orientation = Horizontal

Use Partial Labels for Intermediate Stations: Enable this toggle if the "full station" content to the left of the "+" symbol should be omitted at intermediate stations. This is useful for large station values where intermediate station labels are desired. When enabled (assuming 100' station values), an intermediate station such as 1023+50 would simply be annotated as +50.

Increment Station Text from Beginning Station: Enable this option if you wish to have the station text labels be relative to the starting station value. For example, if the starting station value is 0+23.68 and the *Station Text* interval is 50, station labels of 0+73.68, 1+23.68, 1+73.68, *etc*, would be generated.

Label Elevations: Disable this option if you do not want elevation labels to be placed along the grid.

Draw Elevation Bar: Click on this option if you desire to have a vertical barscale displayed. It will run up and along the left-most vertical grid line of the profile, unless the Draw Vertical Bar on Right option is selected.

Draw Elevation Labels Only On Left Side: Enabling this option eliminates elevation labels on the right side of the profile.

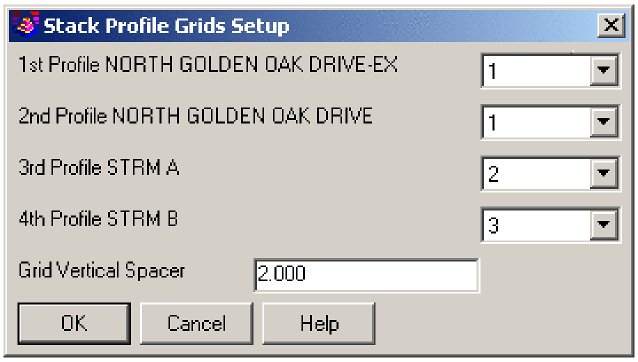
Draw Grid Line Under Elevation Labels: Enabling this option extends the grid lines underneath the elevation labels.

Elev Text Vertical Justify: Indicate vertical justification for the elevation labels.

Offset Elevation Text: This option offsets the left-side vertical axis text using the specified Offset Scale.

Offset Station Text: This option offsets the horizontal axis Station text by the specified Offset Scale, allowing the insertion of elevation or other information above the stationing. It is often used in conjunction with the Label Horizontal Axis options.

Stack Profile Grids: This option allows to stack profile grids for multiple profiles. In the Setup dialog, all profiles in the multiple profile file are listed and you can choose which one goes to first grid, which one is second and so on.


Stack Profile Grids Setup

1st Profile NORTH GOLDEN OAK DRIVE-EX: 1

2nd Profile NORTH GOLDEN OAK DRIVE: 1

3rd Profile STRM A: 2

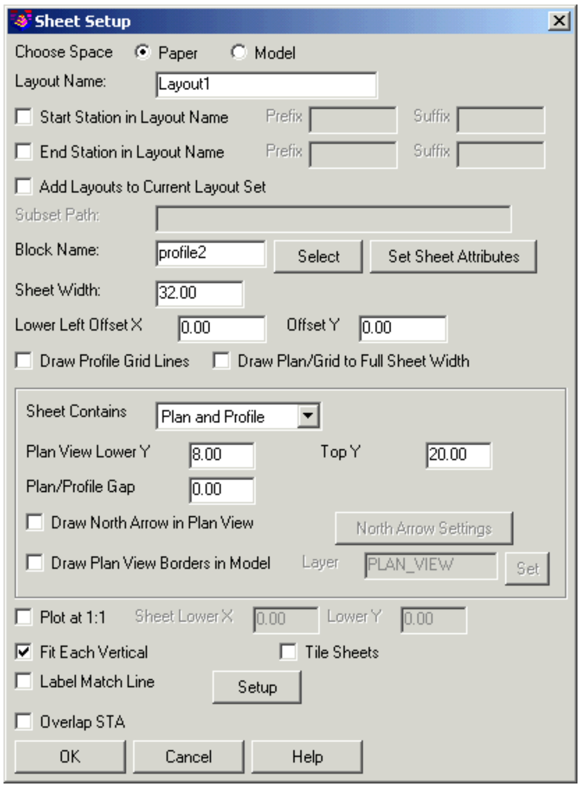
4th Profile STRM B: 3

Grid Vertical Spacer: 2.000

Grid Vertical Spacer: Indicate the amount of vertical space between successive grids.

Draw Sheet

Plan Only, Profile Only, or Plan and Profile sheets can be created. The options within Sheet Setup become available when this toggle is checked on. Pick Setup to access the Sheet Setup dialog.


Sheet Setup

Choose Space: ● Paper ○ Model

Layout Name: Layout1

☐ Start Station in Layout Name Prefix Suffix

☐ End Station in Layout Name Prefix Suffix

☐ Add Layouts to Current Layout Set

Subset Path:

Block Name: profile2

Sheet Width: 32.00

Lower Left Offset X: 0.00 Offset Y: 0.00

☐ Draw Profile Grid Lines ☐ Draw Plan/Grid to Full Sheet Width

Sheet Contains: Plan and Profile

Plan View Lower Y: 8.00 Top Y: 20.00

Plan/Profile Gap: 0.00

☐ Draw North Arrow in Plan View

☐ Draw Plan View Borders in Model Layer: PLAN_VIEW

☐ Plot at 1:1 Sheet Lower X: 0.00 Lower Y: 0.00

☑ Fit Each Vertical ☐ Tile Sheets

☐ Label Match Line

☐ Overlap STA

Choose Space: Indicate whether sheets are to be drawn to Paper Space (also known as a Layout) or to **Model** Space.

Layout Name: Enter a name for the paper space "tabs" to be assigned to each layout for each sheet. The program will automatically divide the plan view and the profile view into sheet layouts, and if the length of the profile extends beyond a single sheet, then multiple layouts are created, with the layout name ID incremented by 1.

Note:

- The "Tile Sheets" toggle needs to be disabled for the auto-incrementing functionality.
- If either the *Start Station in Layout Name* or the *End Station in Layout Name* options are enabled, the Layout Name field will be disabled as the Layouts will get named automatically.

If you enter "ms" to go to model space within a Layout tab, you can pan to alter the plan view position. However, it is best to zoom in/out and edit within the Model tab. The Layout tabs appear at the bottom of the screen, along with the "Model space" tab to go back to standard plan view:

Model
Layout1
LAYOUT2

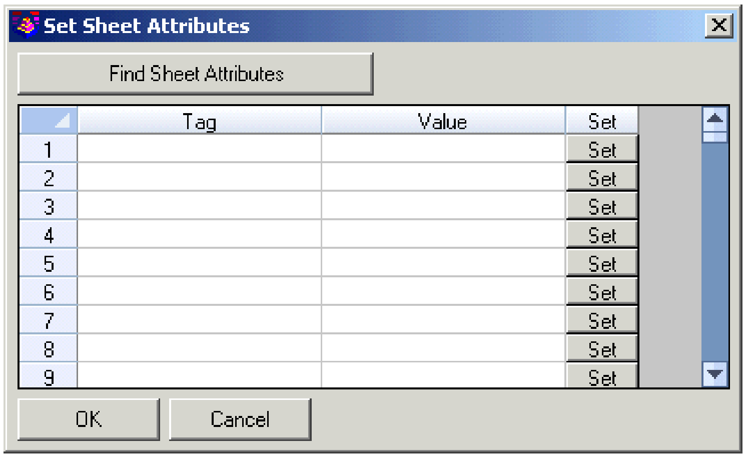
Start/End Station in Layout Name: These options allow you to include starting and ending station in the Layout Names.

Add Layouts to Current Layout Set: This option allows you to add the layouts created to an existing layout set that was previously generated using the Layout Set Manager. You will need to specify the name of the layout set.

Add Layout Name To File Name For Output To Drawing: When the option to Output To Separate Drawing is on, this option will create a separate DWG file for each layout by adding the layout name to the main DWG file name.

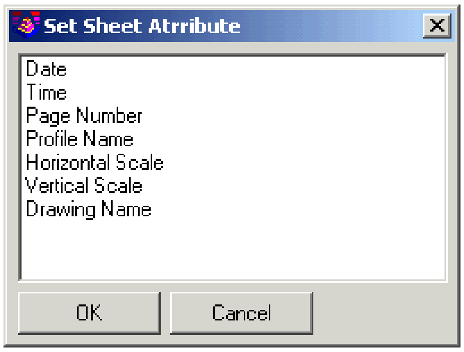
Block Name: This is the drawing name for the plan and profile sheet to be inserted. The Set button can be used to change the block name. Carlson provides a standard plan and profile border in the form of profile.dwg located in the working folder of **%AppData%\Carlson Software\...\Sup**. You may wish to revise profile.dwg and add your company logo, and re-save it as profile1.dwg. Alternatively, you could add your own complete version of a Plan and Profile sheet block/border. Be aware that the *Draw Right to Left* option in Draw Grid is superseded when Draw Sheet is enabled. Note that the Sheet mode will re-orient the centerline left to right, which may cause text (such as the stationing) to plot upside down, until you use the Flip Text command.

Set Sheet Attributes: This button allows you to specify the values used by any attributes associated with the sheet block. These can be entered manually in the Set Sheet Attributes dialog.



	Tag	Value	Set
1			Set
2			Set
3			Set
4			Set
5			Set
6			Set
7			Set
8			Set
9			Set

You can use the Set button to the right of any field to set that field to a preset value pulled from the drawing information.



Sheet Width: This is the profile width, in inches, on the sheet.

Lower Left Offset X/Y: Indicate the offset value(s) for the insertion point of the sheet in CAD units. This option allows user-defined Block Names to be properly positioned relative to the remainder of entities placed through the Draw Profile command.

Draw Profile Grid Lines: Enable this option if your Block Name does not contain profile grid lines and if you want profile grid lines to appear on the sheet.

Draw Plan/Grid to Full Sheet Width: Enable this option if you want to have "partial" sheets (typically found at the end of a Plan & Profile Sheet run) occupy the full width of the sheet.

Sheet Contains: This drop list allows the selection of which type of sheet to generate. The choices are Plan and Profile, Plan Only or Profile Only.

Plan View Lower Y: This sets the lower position of the paper space window for the plan view. With Lower Y set to 9 (inches above the base of the sheet) and Top Y set to 21, there is a 12 inch vertical window, running the full Sheet Width (typically 30 to 32). This window for the plan view can be expanded or reduced with these settings.

Top Y: This sets the top vertical limit for the plan view window, measured in inches from the bottom of the plan and profile sheet.

Plan/Profile Gap: Indicate the amount of vertical separation between the Plan portion of the sheet and the Profile portion of the sheet.

Draw North Arrow in Plan View: This draws a North Arrow in plan view. Click the **North Arrow Settings** button to establish the desired North arrow and placement information.

Draw Plan View Borders in Model Space: This draws the borders in Model Space which can be useful or orienting text and other labels to the orientation of the sheet. When this option is selected, use the Layer text box or Set button to choose the layer on which the borders will be drawn.

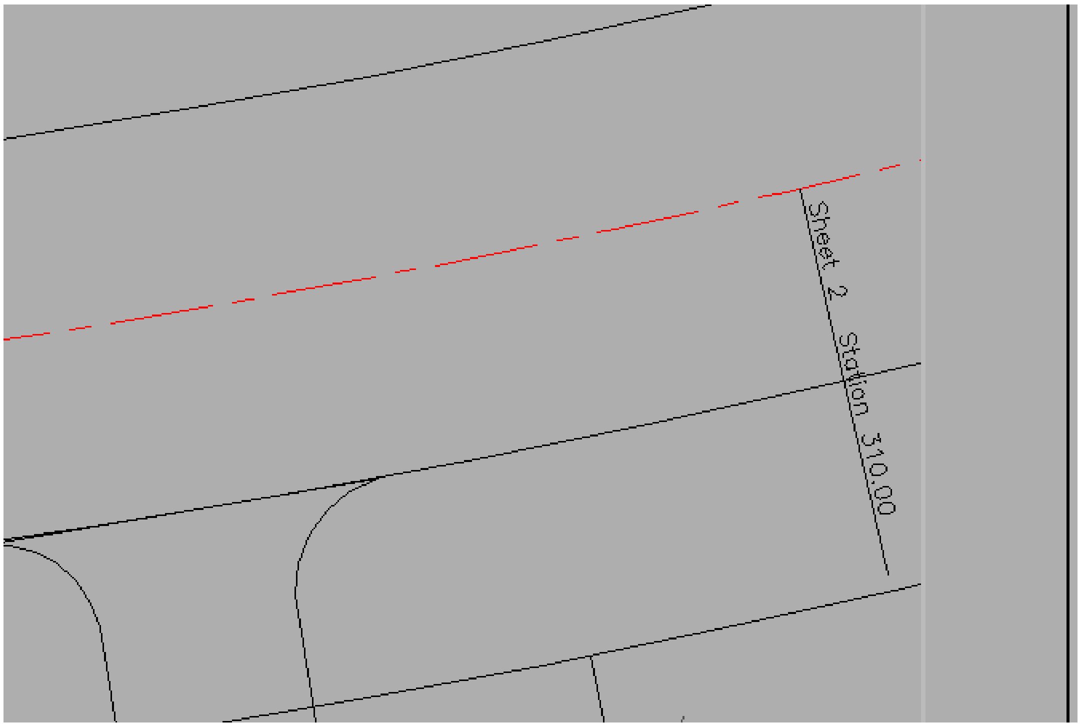
Plot at 1:1: With this clicked on, the sheet will be paper size, designed to be plotted at 1:1. A 30-inch profile sheet will measure 30 units, even though the centerline and profile may be 1500 feet in length. If the Scale 1:1 option is turned on, then you cannot check the distances of features using commands such as Bearing and Distance on the Inquiry menu, because the distances will be scaled down by a factor equal to the drawing scale (for example, at 1"=50', the reduction in scale factor is 1/50 or 0.02). You can set the absolute starting coordinate for the 1:1 scaled plot by setting the **Sheet Lower X** and **Sheet Lower Y** values. With this clicked off, the profile will drawn full size, with a 1500-foot profile measuring 1500 feet.

Fit Each Vertical: With this option turned on, the program will size the profile grid to fit within the vertical space on the profile sheet. With this option off, the profile grid is sized to fit the elevation range of the profile.

Tile Sheets: If clicked on, only one Layout is created in paper space, and all sheets appear in this single Layout as tiles of individual sheets, much like the tiles mode of viewing files within Windows Explorer.

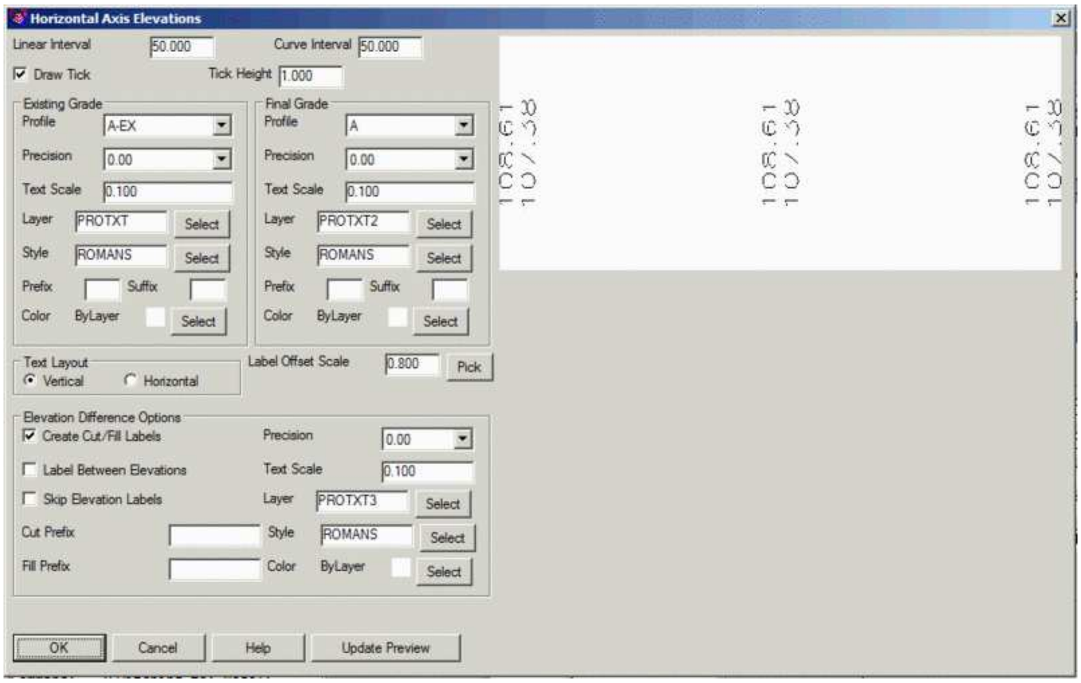
Label Match Line: When clicked on and multiple sheets are plotted with plan view option on, a match line will plot in the plan view.

Overlap STA In multiple plan and profile sheet plotting, after the first sheet, all subsequent sheets will have the first 2 stations in common with the last 2 stations on the previous sheet, if the Overlap Station option is turned on. For example, if the last 2 stations are 3+10 and 3+20 on sheet 1, then sheet 2 will start with 3+10, then 3+20, with this option turned on. With this option turned off, if the first sheet ends with 3+20, then the second sheet would begin with 3+20.



Draw Horiz Axis Elev

This option creates elevation labels along the horizontal axis. Pick Setup to access the Horizontal Axis Elevations settings dialog. A preview of the labels will be shown to the right of the settings. If the preview does not match the settings, click the Update Preview button.



Horizontal Axis Elevations

Linear Interval: 50.000
Curve Interval: 50.000
☑ Draw Tick
Tick Height: 1.000

Existing Grade
Profile: A-EX
Precision: 0.00
Text Scale: 0.100
Layer: PROTXT
Style: ROMANS
Prefix:
Suffix:
Color: ByLayer

Final Grade
Profile: A
Precision: 0.00
Text Scale: 0.100
Layer: PROTXT2
Style: ROMANS
Prefix:
Suffix:
Color: ByLayer

Text Layout
● Vertical
○ Horizontal

Label Offset Scale: 0.800

Elevation Difference Options
☑ Create Cut/Fill Labels
☐ Label Between Elevations
☐ Skip Elevation Labels
Cut Prefix:
Fill Prefix:
Precision: 0.00
Text Scale: 0.100
Layer: PROTXT3
Style: ROMANS
Color: ByLayer

Linear and Curve Interval: Indicate how often the profile elevation labels should be placed along the horizontal axis of the sheet. The Curve Interval applies within vertical curves and the linear applies everywhere else.

Draw Tick and Tick Height: This option draws a line at the specified height at each station for the elevation labels.

Existing/Final Grade: Indicate the appropriate profile, precision, text scale, layer, style, prefix, suffix and color for the text labels.

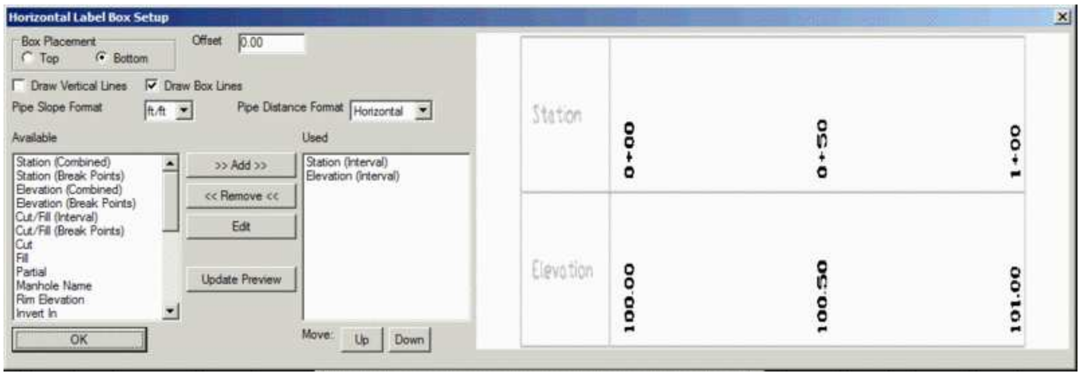
Text Layout: Indicate whether the text labels should be oriented vertically or horizontally.

Label Offset Scale: Indicate the distance from the horizontal axis for the labels. If the value is negative, the labels are placed above the horizontal axis.

Elevation Difference Options: If both existing grade and final grade are to be drawn, you may choose to also label the Cut/Fill depth value that separates the existing and final profiles at each station.

Draw Horiz Label Box

This option draws a boxed area either above or below the profile. It is best used in standard Draw Grid mode, with Draw Sheets clicked off. Pick Setup to access the Horizontal Label Box Setup dialog which has a list of available fields to label. To label a field, highlight the field from the Available list and pick the Add button. Then use the Up/Down buttons to order the fields in the Used list.
Offset: This controls how far to offset the label box from the profile. This value is a scaler that is multiplied by the profile horizontal scale.
Draw Vertical Lines: This option draws lines from the data point on the profile to the label in the box.
Draw Box Lines: This option draws the row and column lines for the label box.



Horizontal Label Box Setup

Box Placement: ○ Top ● Bottom

Offset: 0.00

☐ Draw Vertical Lines ☑ Draw Box Lines

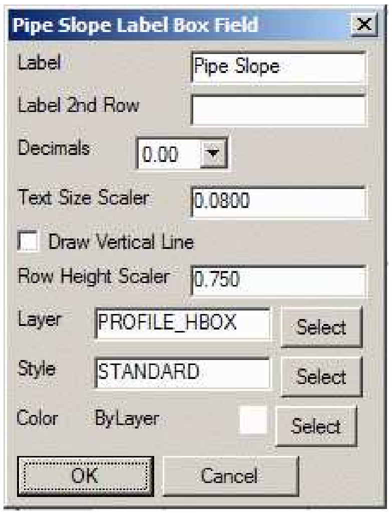
Pipe Slope Format: ft/ft

Pipe Distance Format: Horizontal

Available:
- Station (Combined)
- Station (Break Points)
- Elevation (Combined)
- Elevation (Break Points)
- Cut/Fill (Interval)
- Cut/Fill (Break Points)
- Cut
- Fill
- Partial
- Manhole Name
- Rim Elevation
- Invert In

Used:
- Station (Interval)
- Elevation (Interval)

Use the Edit button to set parameters for the label in the box. The Label 2nd Row option creates another row for the field.



Pipe Slope Label Box Field

Label: Pipe Slope

Label 2nd Row:

Decimals: 0.00

Text Size Scaler: 0.0800

☐ Draw Vertical Line

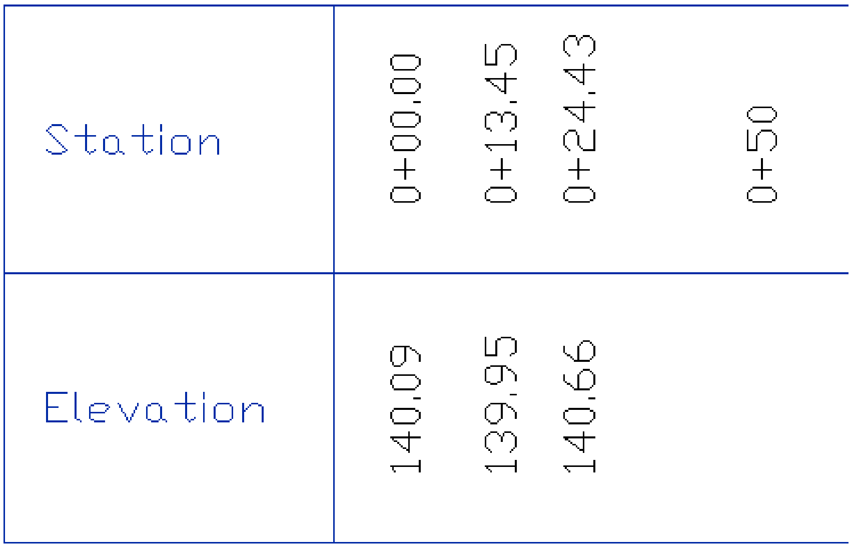
Row Height Scaler: 0.750

Layer: PROFILE_HBOX

Style: STANDARD

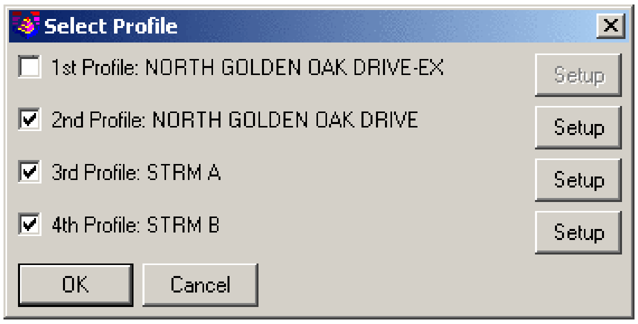
Color: ByLayer

An example of the resulting plot is shown here:


Station
0+00.00
0+13.45
0+24.43
0+50
Elevation
140.09
139.95
140.66

Draw Slope Labels

When enabled, this option allows you to detail additional slope information onto selected profiles.


Select Profile

☐ 1st Profile: NORTH GOLDEN OAK DRIVE-EX

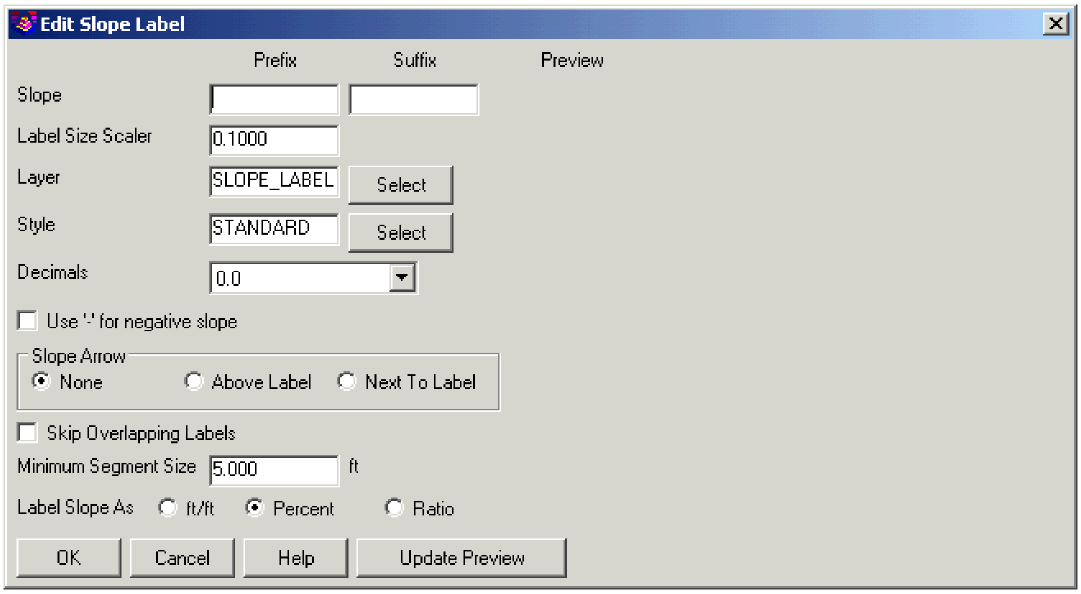
☑ 2nd Profile: NORTH GOLDEN OAK DRIVE

☑ 3rd Profile: STRM A

☑ 4th Profile: STRM B

Setup
Setup
Setup
Setup
OK
Cancel

Indicate the desired profile(s) whose slope annotation you'd like to control and click on the Setup button for expanded criteria.


Edit Slope Label

	Prefix	Suffix
Slope		
Label Size Scaler	0.1000	
Layer	SLOPE_LABEL	
Style	STANDARD	
Decimals	0.0	

☐ Use '-' for negative slope

Slope Arrow: ● None ○ Above Label ○ Next To Label

☐ Skip Overlapping Labels

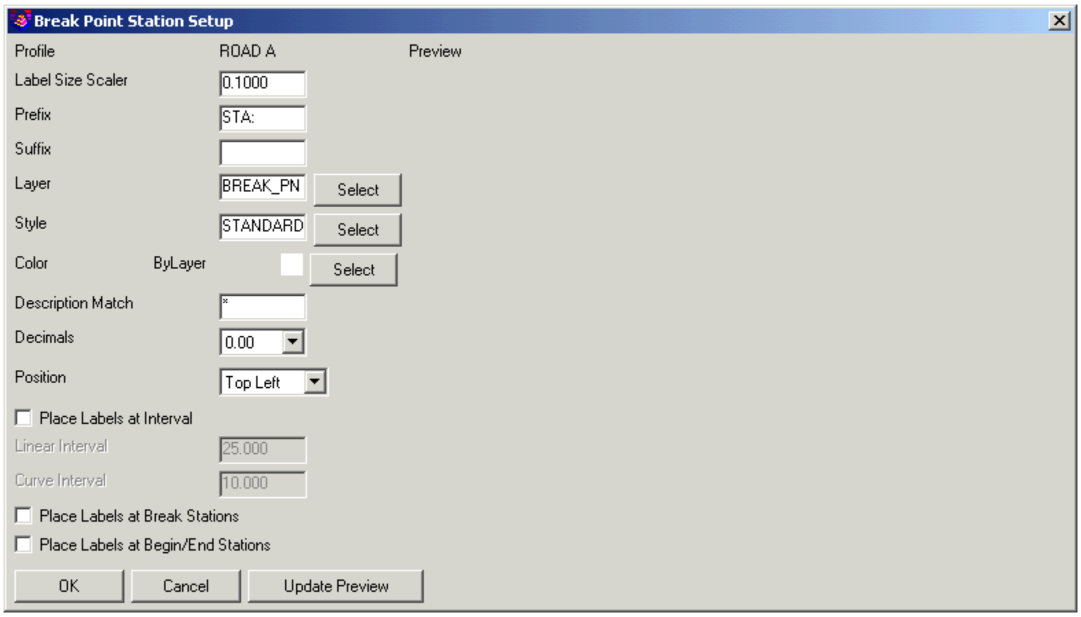
Minimum Segment Size 5.000 ft

Label Slope As ○ ft/ft ● Percent ○ Ratio

Preview
Select
Select
OK
Cancel
Help
Update Preview

Draw Break Point Sta

When enabled, this option will label station values along the profile line above each break point in the profile. Pick **Setup** to access the Break Point Station Setup dialog.



Break Point Station Setup

Profile ROAD A

Label Size Scaler 0.1000

Prefix STA:

Suffix

Layer BREAK_PN

Style STANDARD

Color ByLayer

Description Match *

Decimals 0.00

Position Top Left

☐ Place Labels at Interval

Linear Interval 25.000

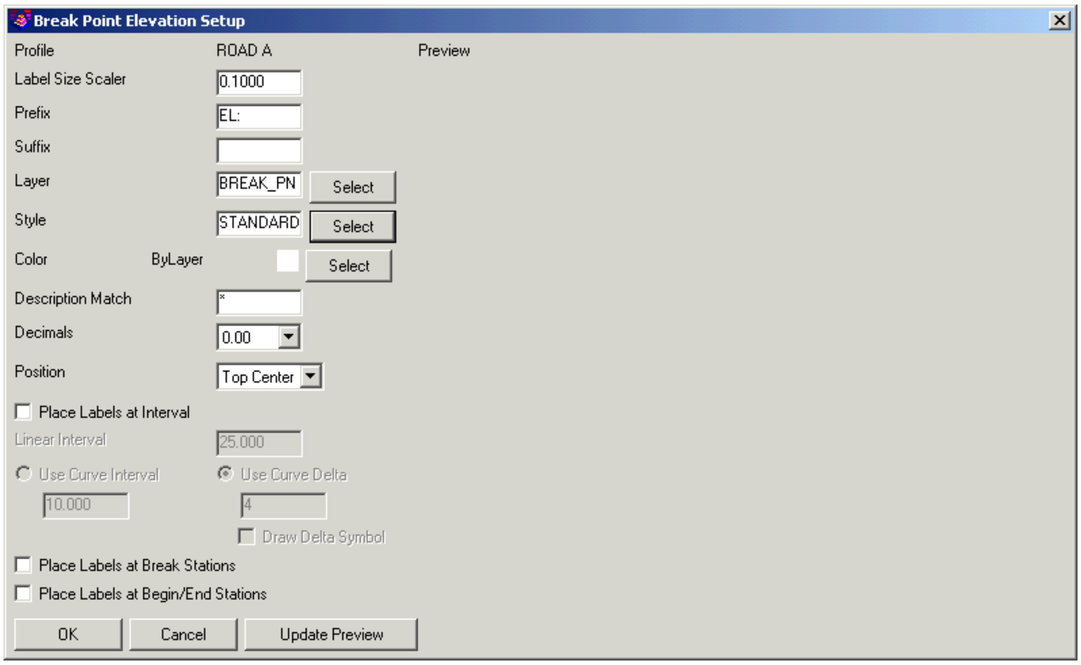
Curve Interval 10.000

☐ Place Labels at Break Stations

☐ Place Labels at Begin/End Stations

Draw Break Point Elev

When enabled, this option will label elevation values along the profile line at each break point in the profile. Pick **Setup** to access the Break Point Elevation Setup dialog.



Break Point Elevation Setup

Profile ROAD A

Label Size Scaler 0.1000

Prefix EL:

Suffix

Layer BREAK_PN

Style STANDARD

Color ByLayer

Description Match *

Decimals 0.00

Position Top Center

☐ Place Labels at Interval

Linear Interval 25.000

○ Use Curve Interval 10.000

● Use Curve Delta 4

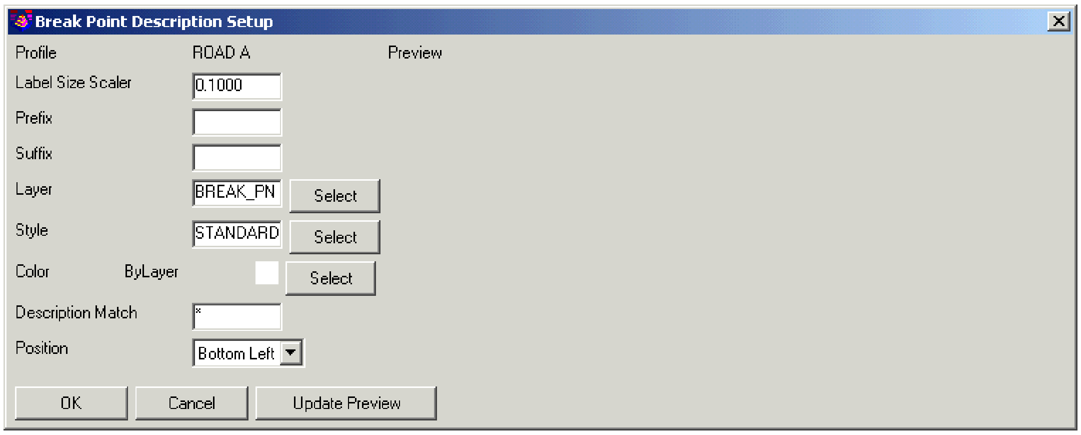
☐ Draw Delta Symbol

☐ Place Labels at Break Stations

☐ Place Labels at Begin/End Stations

Draw Break Point Desc

When enabled, this option will label descriptions along the profile line at each break point in the profile. Pick **Setup** to access the Break Point Description Setup dialog.


Break Point Description Setup

Profile ROAD A

Label Size Scaler 0.1000

Prefix

Suffix

Layer BREAK_PN

Style STANDARD

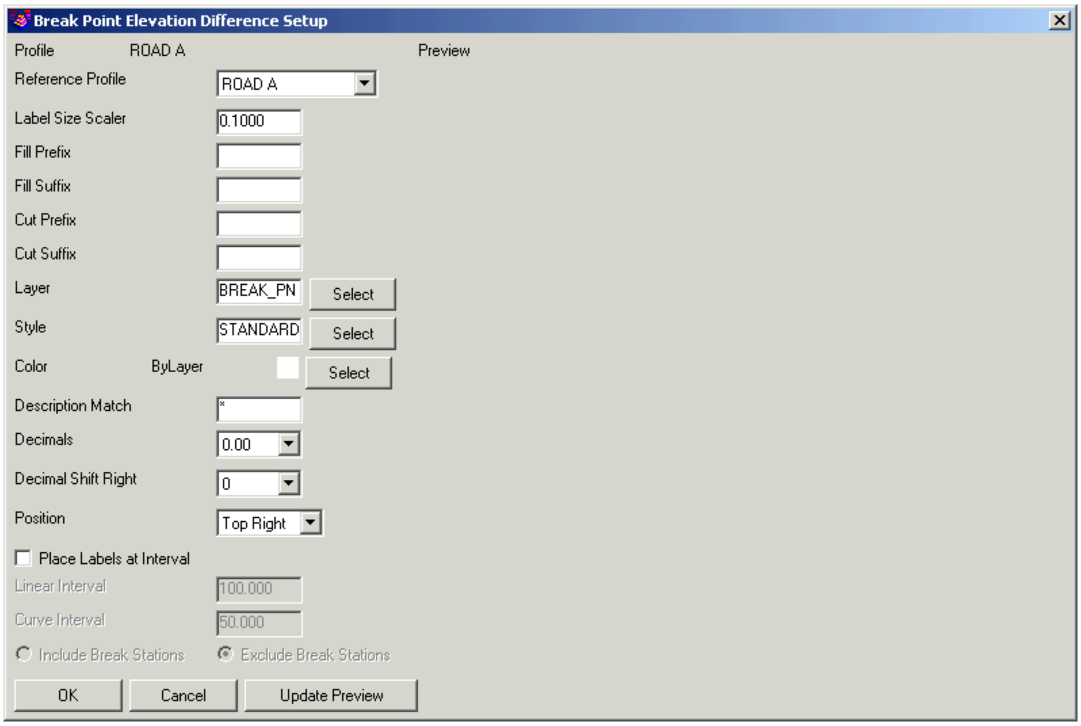
Color ByLayer

Description Match *

Position Bottom Left

Draw Break Point Elev Diff

When enabled, this option will label elevation difference values along the profile line at each break point in the profile relative to a reference profile (*e.g.* existing grade). Pick **Setup** to access the Break Point Elevation Difference Setup dialog.


Break Point Elevation Difference Setup

Profile ROAD A

Reference Profile ROAD A

Label Size Scaler 0.1000

Fill Prefix

Fill Suffix

Cut Prefix

Cut Suffix

Layer BREAK_PN

Style STANDARD

Color ByLayer

Description Match *

Decimals 0.00

Decimal Shift Right 0

Position Top Right

☐ Place Labels at Interval

Linear Interval 100.000

Curve Interval 50.000

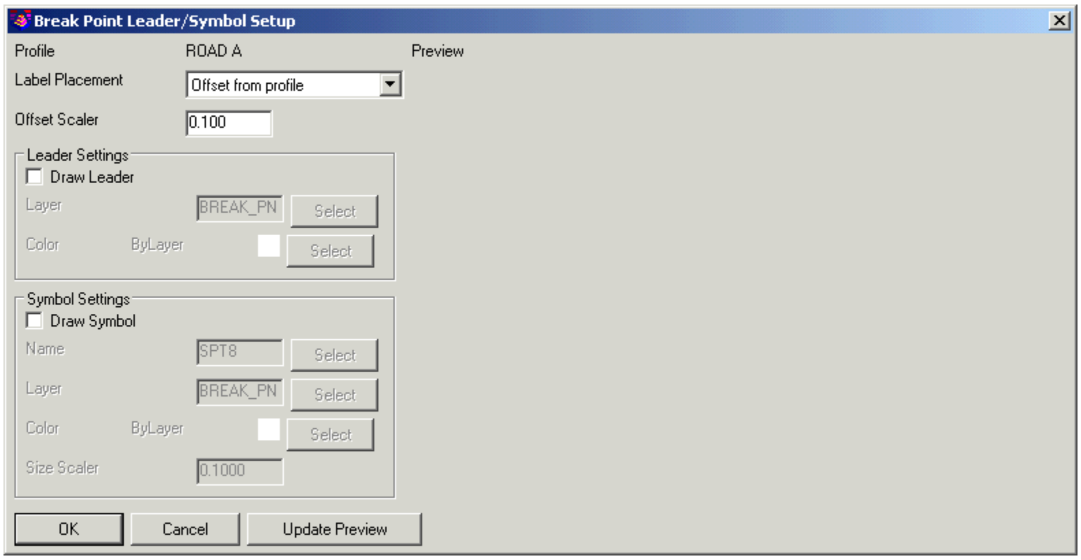
○ Include Break Stations ● Exclude Break Stations

Reference Profile: Indicate the profile that should be used as the point of comparison for the break point locations.

Decimal Shift Right: Indicate the number of places to shift the decimal point to the right. For example, if a traditional elevation difference was calculated to be 1.234 and the Decimal Right Shift value is set to 1 (a factor of 10), the reported elevation difference would be shown as 12.34.

Break Point Leader/Symbol Setup

Click this button to establish if it desirable to have a leader and/or break point symbol used in conjunction with the **Draw Break Point Sta** and/or **Draw Break Point Elev** options.


Break Point Leader/Symbol Setup

Profile ROAD A

Label Placement Offset from profile

Offset Scaler 0.100

Leader Settings

☐ Draw Leader

Layer BREAK_PN

Color ByLayer

Symbol Settings

☐ Draw Symbol

Name SPT8

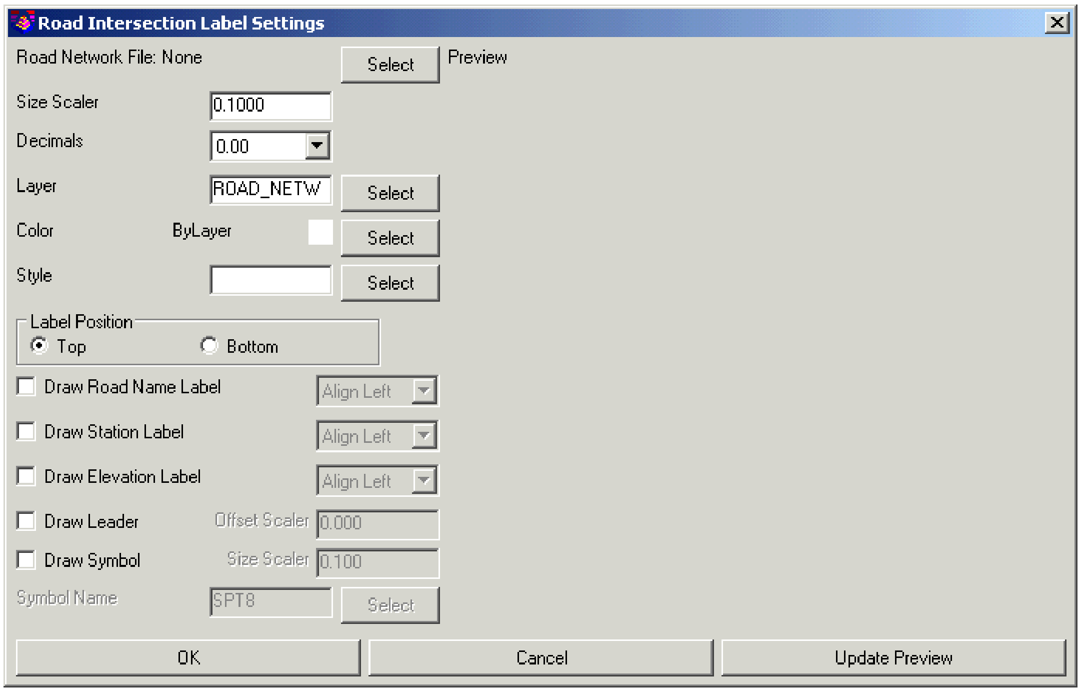
Layer BREAK_PN

Color ByLayer

Size Scaler 0.1000

Draw Road Intersections

When enabled, this option will label the location(s) of any road(s) from an identified Road Network that intersect the main road.


Road Intersection Label Settings

Road Network File: None

Size Scaler 0.1000

Decimals 0.00

Layer ROAD_NETW

Color ByLayer

Style

Label Position

● Top ○ Bottom

☐ Draw Road Name Label Align Left

☐ Draw Station Label Align Left

☐ Draw Elevation Label Align Left

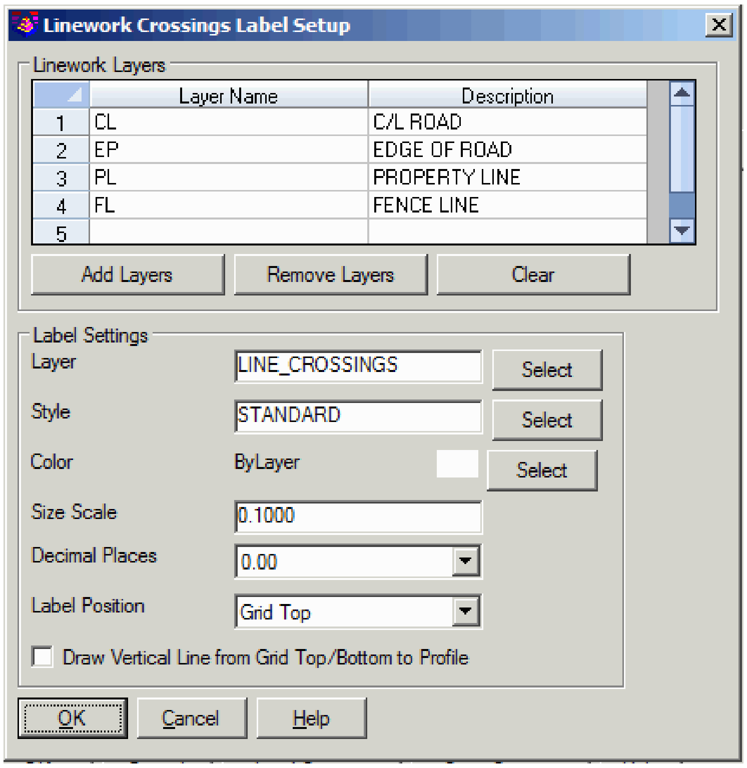
☐ Draw Leader Offset Scaler 0.000

☐ Draw Symbol Size Scaler 0.100

Symbol Name SPT8

Draw Linework Crossings

This option draws labels for linework that crosses the reference centerline. The reference centerline is set in the first Draw Profile dialog where the profiles to draw are selected. The setup dialog for Linework Crossings has a list of layers. The program will find intersections between the reference centerline and linework on these specified layers. For each layer, there is a Description which is used for the label on the profile. Besides labeling these descriptions for the crossings, the program includes the station along the reference centerline at the crossing. In the options dialog, there are settings to control the layer, style, color, size, decimal places for the station label, label position and whether to draw a vertical line from the label to the profile.



Linework Crossings Label Setup

Linework Layers

	Layer Name	Description
1	CL	C/L ROAD
2	EP	EDGE OF ROAD
3	PL	PROPERTY LINE
4	FL	FENCE LINE
5		

Add Layers
Remove Layers
Clear

Label Settings

Layer: LINE_CROSSINGS

Style: STANDARD

Color: ByLayer

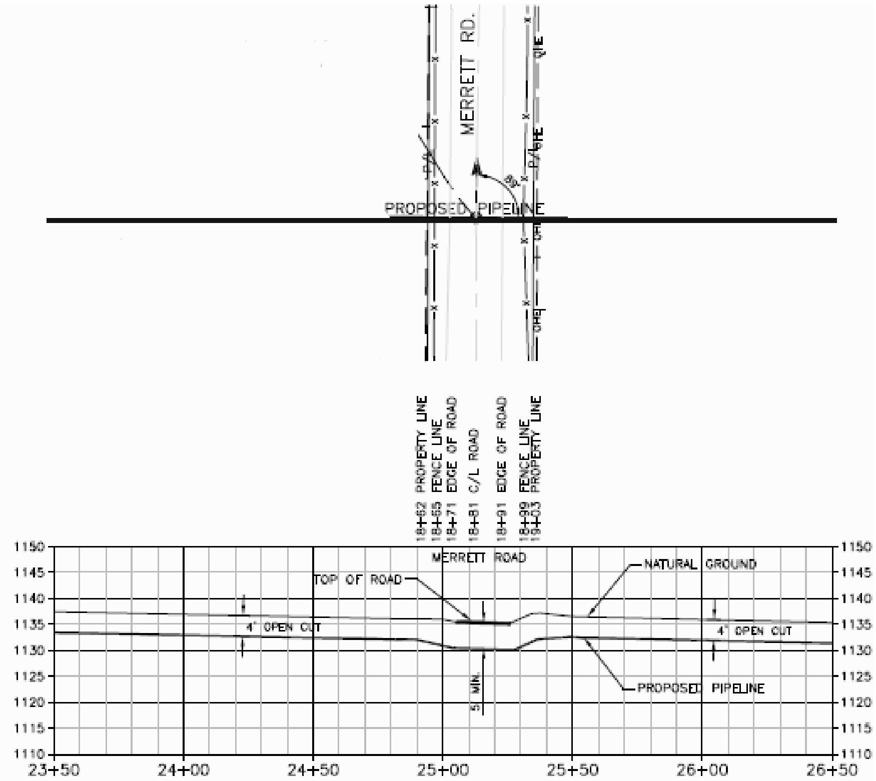
Size Scale: 0.1000

Decimal Places: 0.00

Label Position: Grid Top

☐ Draw Vertical Line from Grid Top/Bottom to Profile

Select
Select
Select
OK
Cancel
Help



MERRETT RD.
OHE
PROPOSED PIPELINE
18+62 PROPERTY LINE
18+65 FENCE LINE
18+71 EDGE OF ROAD
18+81 C/L ROAD
18+91 EDGE OF ROAD
18+99 FENCE LINE
19+03 PROPERTY LINE
MERRETT ROAD
TOP OF ROAD
NATURAL GROUND
4' OPEN CUT
4' OPEN CUT
5' MIN.
PROPOSED PIPELINE
1150
1145
1140
1135
1130
1125
1120
1115
1110
23+50
24+00
24+50
25+00
25+50
26+00
26+50

Output to Separate Drawing

When enabled, this option draws the profile(s) to a separate drawing. Click the Set button to specify the name/location of the external drawing. Suggested uses for this feature are when profile-only sheets need to be generated and provided to others for detail or construction purposes.

Link To Files: This setting controls the linkage of the plotted profile(s) to the actual profile file(s) (.PRO), determining how changes to the file affect the plotted profile(s):

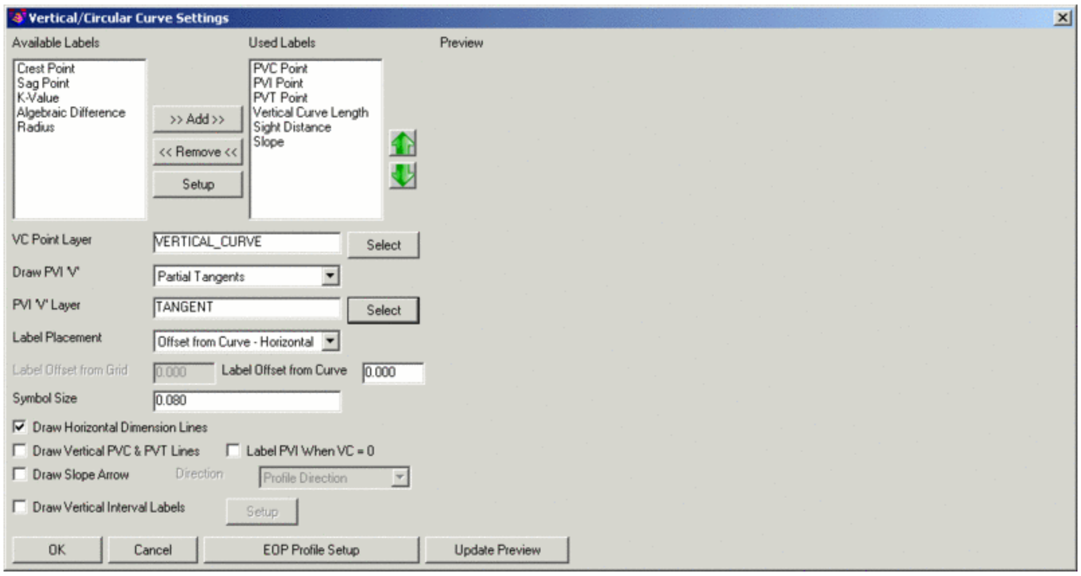
- *Off* - Changes to an underlying profile file do not trigger a change to its drawn profile.
- *Prompt* - Changes to an underlying profile file trigger a prompt if its drawn profile should be updated.
- *Auto* - Changes to an underlying profile file result in an automatic change to its drawn profile.

Match Line Elevations: For high relief profiles that might otherwise extend up and into the plan view portion of the drawing, the Match Line Elevations option can be used to break the profile and redraw the remaining portion vertically shifted to remain in the profile portion of the sheet.

Elevation Range: This is the range of elevations that is used in conjunction with the Match Line Elevation option. If the range is exceeded (that is, if the range greater than 40), the program will break the profile and draw the remainder with a separate vertical axis range.

Road Labels

This button opens Vertical/Circular Curve Settings dialog. From a wide variety of available labels, you are able to create your own label selections very conveniently. Each label can be edited individually through the Setup button. You can specify the prefix, suffix, symbol style, decimal places, text orientation and position, *etc*, in the Edit Label dialog.



Vertical/Circular Curve Settings

Available Labels: Crest Point, Sag Point, K-Value, Algebraic Difference, Radius

Used Labels: PVC Point, PVI Point, PVT Point, Vertical Curve Length, Sight Distance, Slope

VC Point Layer: VERTICAL_CURVE

Draw PVI 'V': Partial Tangents

PVI 'V' Layer: TANGENT

Label Placement: Offset from Curve - Horizontal

Label Offset from Grid: 0.000

Label Offset from Curve: 0.000

Symbol Size: 0.080

☑ Draw Horizontal Dimension Lines

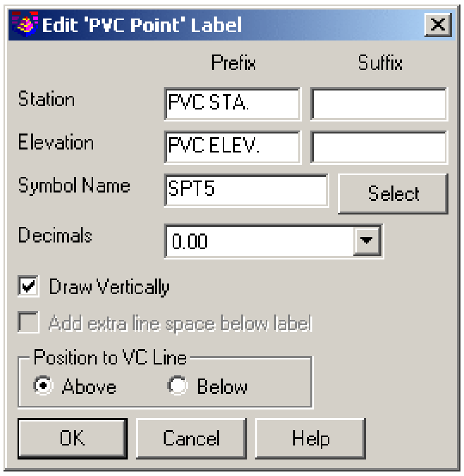
☐ Draw Vertical PVC & PVT Lines

☐ Label PVI When VC = 0

☐ Draw Slope Arrow

Direction: Profile Direction

☐ Draw Vertical Interval Labels



Edit 'PVC Point' Label

	Prefix	Suffix
Station	PVC STA.	
Elevation	PVC ELEV.	

Symbol Name: SPT5

Decimals: 0.00

☑ Draw Vertically

☐ Add extra line space below label

Position to VC Line: ● Above ○ Below

Draw PVI 'V': You can choose to draw either a full tangents style PVI 'V' point, or a partial tangents style, or nothing.

Label Placement: This setting determines where to place the vertical curve labels. There are six options: Pick Single Row, Pick Individual Position, Auto Place Above Highest PVI Point, Specify Offset from Grid Top, Offset from Curve - Aligned, Offset from Curve - Horizontal.

Label Offset from Grid/Curve: Indicate the distance from the Grid or Curve when the **Label Placement** option is set to *Offset from Grid Top* or *Offset from Curve*, respectively.

Draw Horizontal Dimension Lines: This option draws horizontal lines connecting the PVC and PVT of all vertical curves.

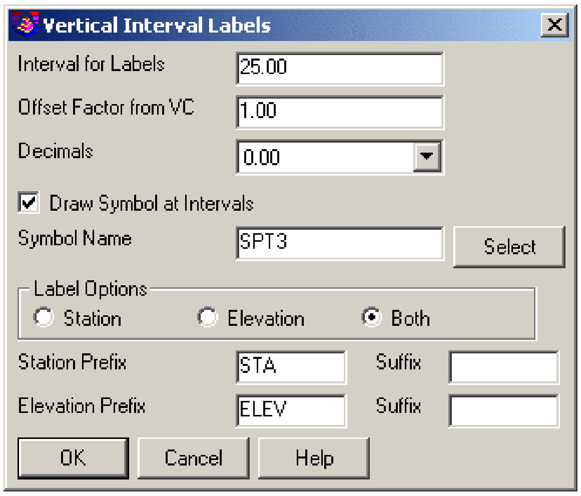
Draw Vertical PVC & PVT Lines: This option draws vertical lines emanating from the PVC and PVT of all vertical curves.

Label PVI When VC=0: When vertical curve length is 0, no label is created unless you choose this option and then the PVI label would be shown.

Draw Slope Direction Arrow: Draws an arrow to indicate slope direction.

Arrow Direction: You can choose from Profile Direction, Uphill Slope Direction and Downhill Slope Direction.

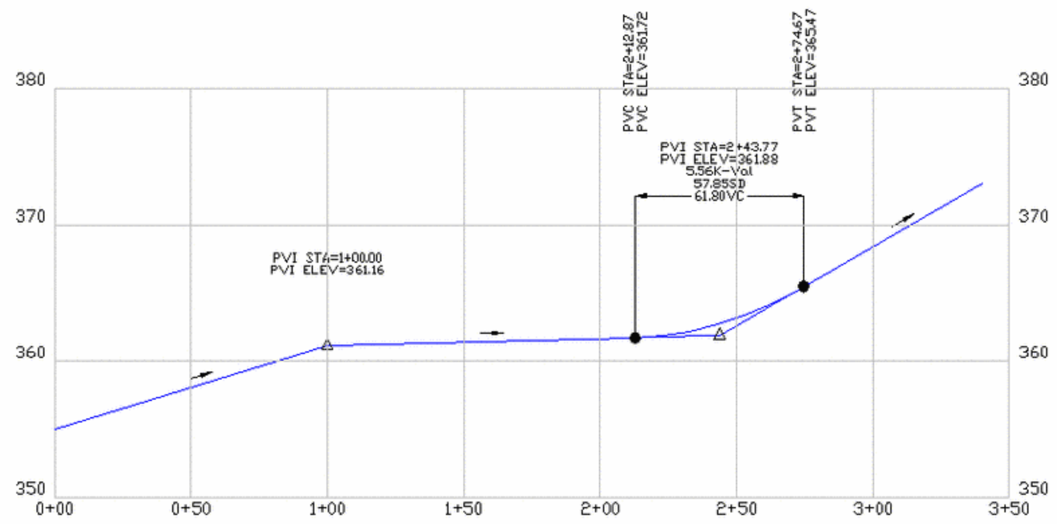
Draw Vertical Interval Labels: This option labels the intervals of the vertical curve section. In its setup dialog, you can specify the intervals, distance from the vertical curve to put the labels, decimal places to display the interval stations and elevations, symbol settings and label settings.



Interval for Labels: 25.00
Offset Factor from VC: 1.00
Decimals: 0.00
☑ Draw Symbol at Intervals
Symbol Name: SPT3

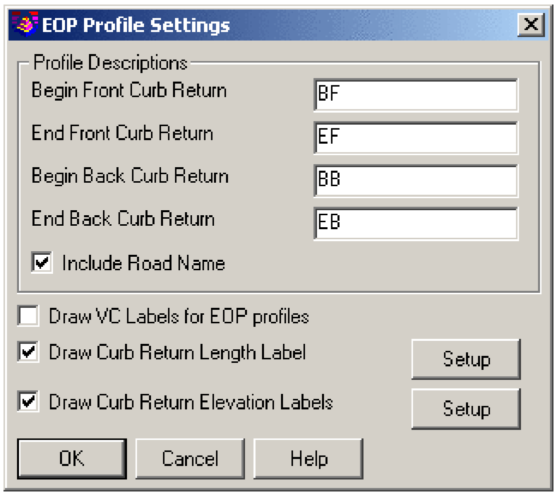
Label Options: ○ Station ○ Elevation ● Both
Station Prefix: STA Suffix:
Elevation Prefix: ELEV Suffix:

Here is an example of a road profile.



EOP Profile Setup

This button allows you to establish the criteria for drawing and labeling Edge of Pavement (EOP) profiles:



Profile Descriptions

Begin Front Curb Return: BF

End Front Curb Return: EF

Begin Back Curb Return: BB

End Back Curb Return: EB

☑ Include Road Name

☐ Draw VC Labels for EOP profiles

☑ Draw Curb Return Length Label

☑ Draw Curb Return Elevation Labels

Begin/End Front Curb Return: Enter a description for the front curb return.

Begin/End Back Curb Return: Enter a description for the back curb return.

Include Road Name: Enable this control if you'd like the road name included with the edge of pavement profile.

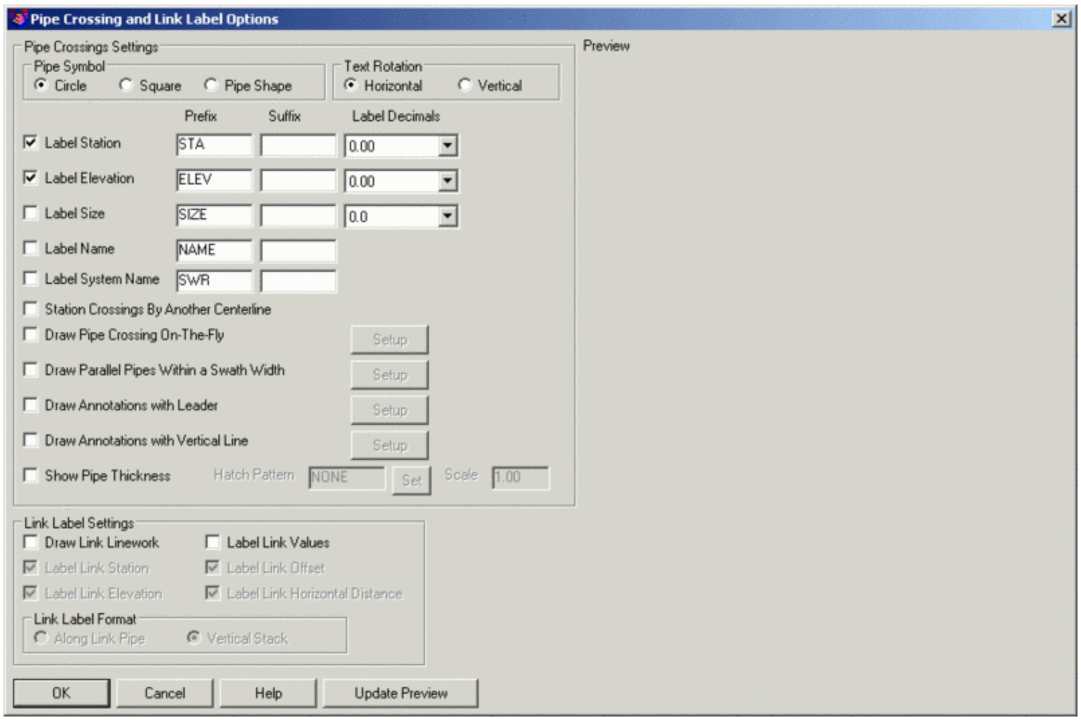
Draw VC Labels for EOP Profiles: When enabled, this option will label vertical curves found in edge of pavement profiles.

Draw Curb Return Length Label: When enabled, this option will label the length of curb returns. Use the Setup button to specify and control the display settings.

Draw Curb Return Elevation Labels: When enabled, this option will label the elevations of curb returns. Use the Setup button to specify and control the placement and display settings.

Pipe Crossing Labels

This button opens Pipe Crossing and Link Label Options dialog, which contains all the settings for drawing a pipe crossing type or profile, or the pipe crossings when pipes or sewer networks in the drawing are intercepted by a profile to be drawn.



Pipe Crossings Settings

Pipe Symbol: ● Circle ○ Square ○ Pipe Shape

Text Rotation: ● Horizontal ○ Vertical

	Prefix	Suffix	Label Decimals
☑ Label Station	STA		0.00
☑ Label Elevation	ELEV		0.00
☐ Label Size	SIZE		0.0
☐ Label Name	NAME		
☐ Label System Name	SWR		

☐ Station Crossings By Another Centerline

☐ Draw Pipe Crossing On-The-Fly

☐ Draw Parallel Pipes Within a Swath Width

☐ Draw Annotations with Leader

☐ Draw Annotations with Vertical Line

☐ Show Pipe Thickness   Hatch Pattern: NONE   Scale: 1.00

Link Label Settings

☐ Draw Link Linework

☐ Label Link Values

☑ Label Link Station

☑ Label Link Offset

☑ Label Link Elevation

☑ Label Link Horizontal Distance

Link Label Format: ○ Along Link Pipe ● Vertical Stack

Pipe Symbol: Options to show pipe crossing in circle, square, or based on the pipe shape.

Text Rotation: Labels can be drawn either horizontally or vertically. This option becomes disabled when the *Draw Annotations with Leader* option is enabled.

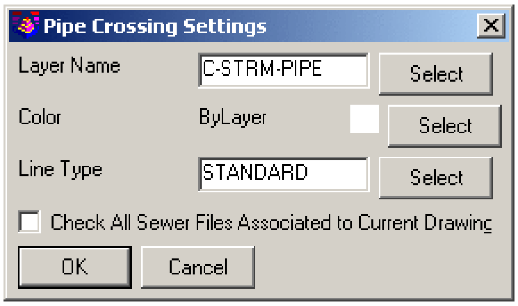
Label Prefix/Suffix: Indicate labels that should precede and/or follow the pipe information.

Label Decimals: Decimal places of the labels.

Label Station/Elevation/Size/Name/System Name: Options to label the parameters or not.

Station Crossings By Another Centerline: This option will make new stations by referencing the profile to another centerline, for example a road centerline.

Draw Pipe Crossing On-The-Fly: When this option is chosen and there are pipes or sewer networks drawn in the drawing, the program will prompt to select a reference centerline that represents one of the profiles to be drawn to detect the pipe crossings. Any pipe crossings found would be drawn with other profiles.


Pipe Crossing Settings

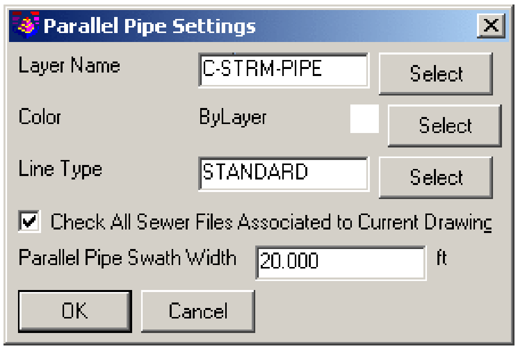
Layer Name C-STRM-PIPE

Color ByLayer

Line Type STANDARD

☐ Check All Sewer Files Associated to Current Drawing

Draw Parallel Pipes Within a Swath Width: When this option is chosen and there are pipes or sewer networks drawn in the drawing, the program will prompt to select a reference centerline that represents one of the profiles to be drawn to detect if there's any pipe segments that are within a swath width along the profile. Any pipe segments found would be drawn with other profiles.


Parallel Pipe Settings

Layer Name C-STRM-PIPE

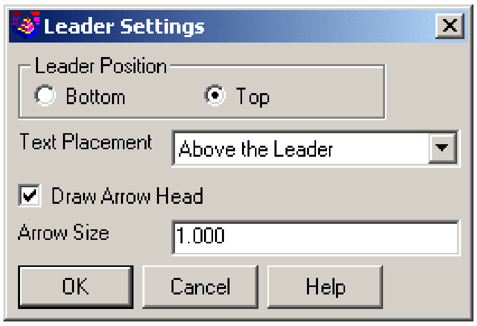
Color ByLayer

Line Type STANDARD

☑ Check All Sewer Files Associated to Current Drawing

Parallel Pipe Swath Width 20.000 ft

Draw Annotations with Leader: When enabled, this uses a leader in conjunction with pipe labels.


Leader Settings

Leader Position

○ Bottom ● Top

Text Placement Above the Leader

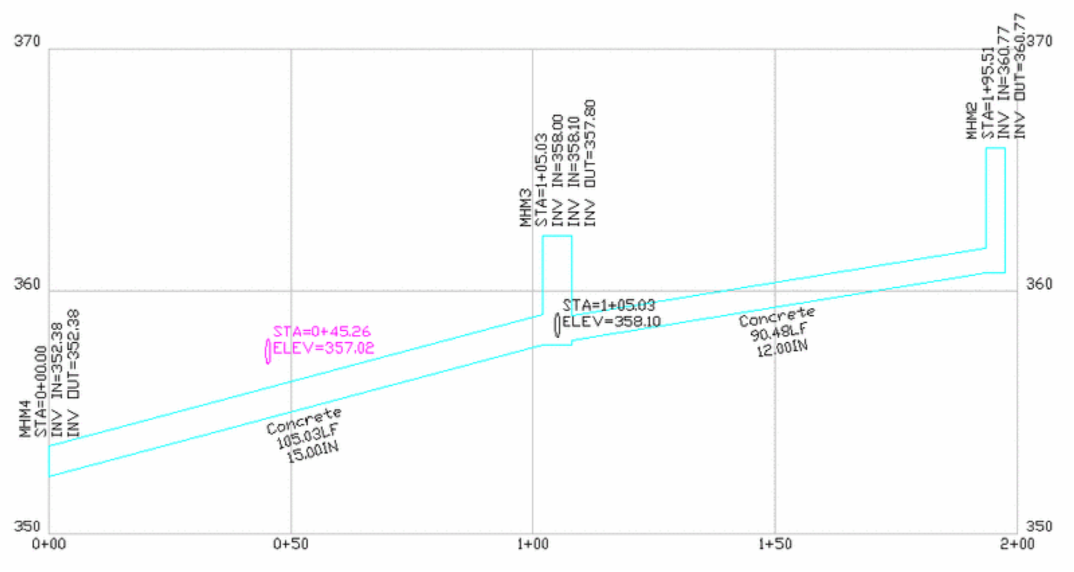
☑ Draw Arrow Head

Arrow Size 1.000

Draw Annotations with Vertical Line: When enabled, this uses a vertical line and orientation to indicate the location of the pipe crossing being labeled.

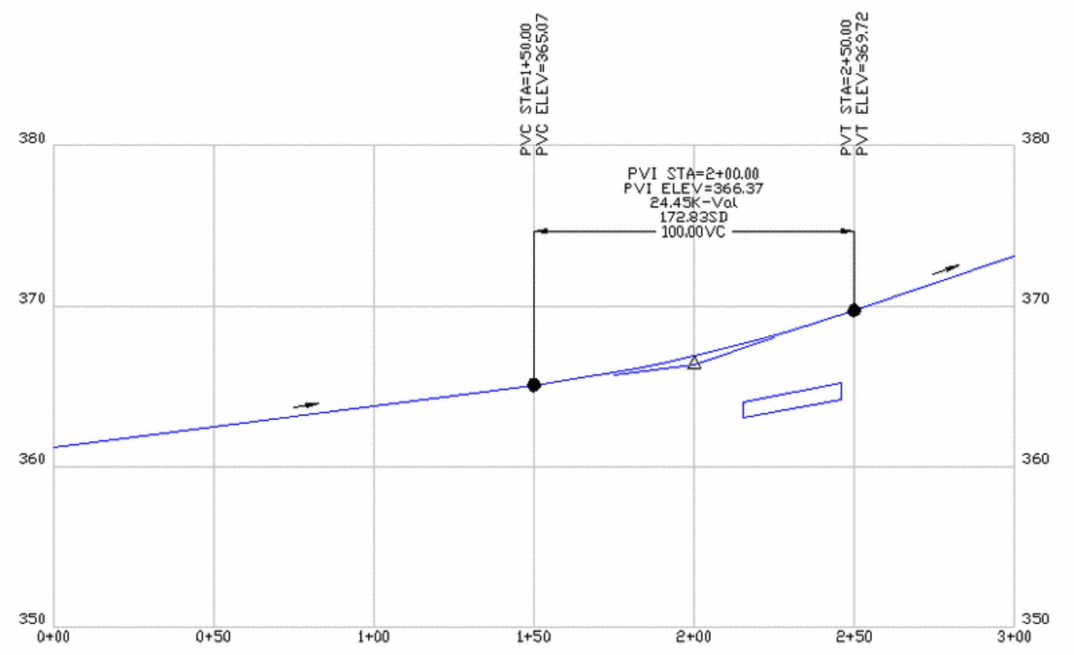
Show Pipe Thickness: When enabled, this draws the pipes in profile using double lines to indicate the thickness of the pipe. The area between the lines can be cross-hatched.

Link Label Settings: Settings to determine how to draw link labels.



370
360
350
MHM4
STA=0+00.00
INV IN=352.38
INV OUT=352.38
STA=0+45.26
ELEV=357.02
Concrete
105.03LF
15.00IN
MHM3
STA=1+05.03
INV IN=358.00
INV IN=358.10
INV OUT=357.80
STA=1+05.03
ELEV=358.10
Concrete
90.48LF
12.00IN
MHM2
STA=1+95.51
INV IN=360.77
INV OUT=360.77
0+00
0+50
1+00
1+50
2+00

An Example of Pipe Crossings On-The-Fly

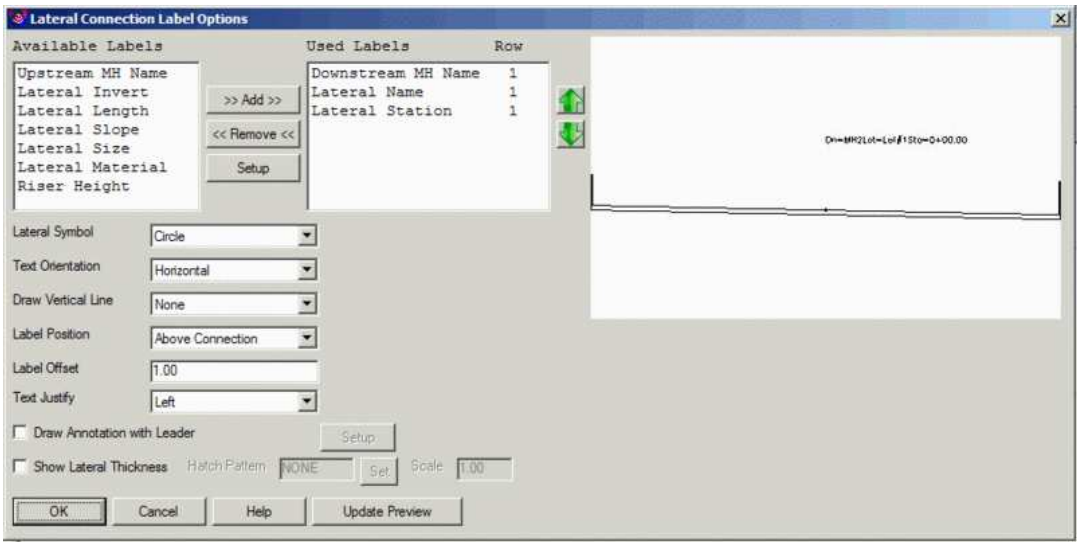


PVC STA=1+50.00
PVC ELEV=365.07
PVT STA=2+50.00
PVT ELEV=369.72
PVI STA=2+00.00
PVI ELEV=366.37
24.45K-Val
172.83SD
100.00VC
380
370
360
350
0+00
0+50
1+00
1+50
2+00
2+50
3+00

An Example of Parallel Pipes Within a Swath Width

Lateral Connection Labels

These settings apply for profiles create from a Sewer Network from the Hydrology module that contains lateral structures. There are several lateral data fields available for labeling. Use the Add/Remove buttons to make the list of fields to label. Use the Setup button to set the prefix and suffix for each field, and control whether the field is labeled on a separate row. There are settings to choose the symbol on the pipe at the lateral station, the text orientation, whether to draw a vertical line at the lateral station, set the label position and offset, set the text justification and whether to draw a leader from the pipe to the label.


Lateral Connection Label Options

Available Labels

- Upstream MH Name
- Lateral Invert
- Lateral Length
- Lateral Slope
- Lateral Size
- Lateral Material
- Riser Height

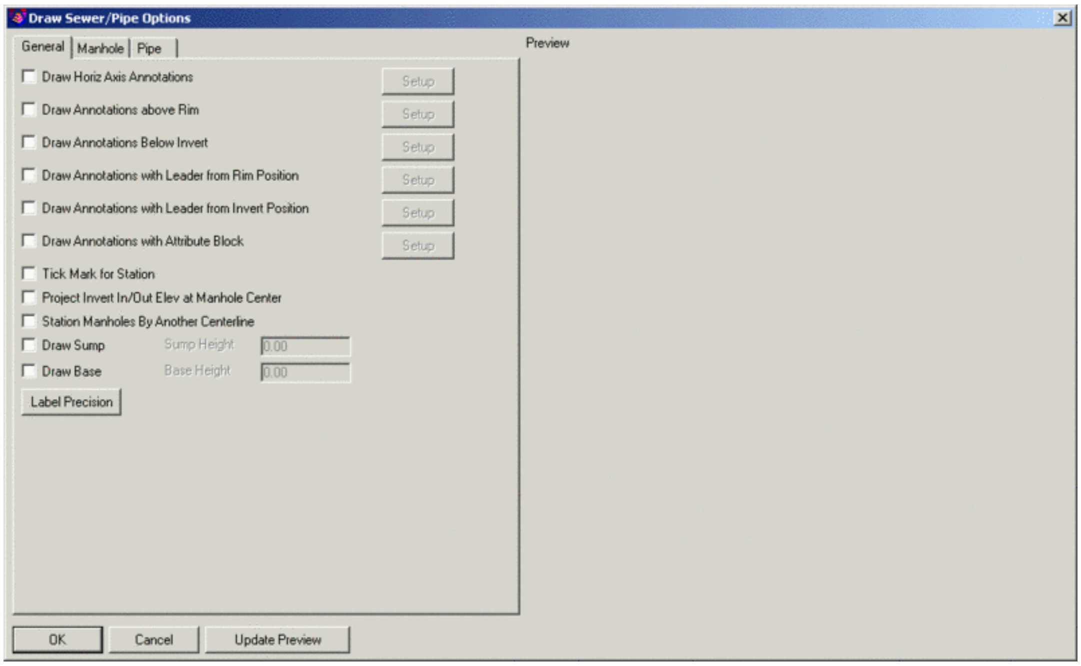
Used Labels	Row
Downstream MH Name	1
Lateral Name	1
Lateral Station	1

Lateral Symbol: Circle
Text Orientation: Horizontal
Draw Vertical Line: None
Label Position: Above Connection
Label Offset: 1.00
Text Justify: Left
☐ Draw Annotation with Leader
☐ Show Lateral Thickness
Hatch Pattern: NONE
Scale: 1.00

Sewer/Pipe Labels

This button opens Draw Sewer/Pipe Options dialog.

General Tab


Draw Sewer/Pipe Options

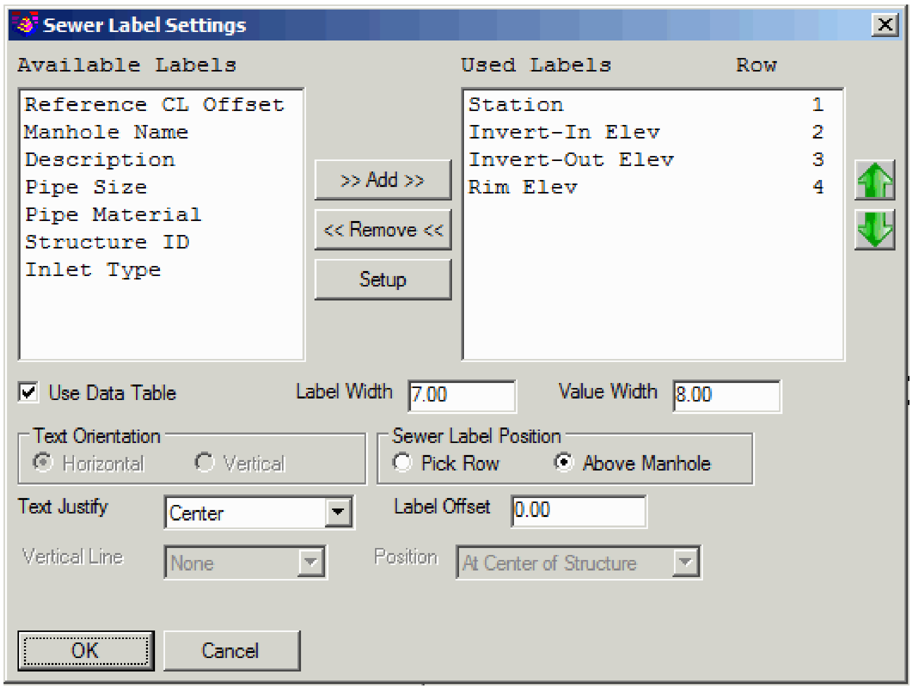
General | Manhole | Pipe

- ☐ Draw Horiz Axis Annotations
- ☐ Draw Annotations above Rim
- ☐ Draw Annotations Below Invert
- ☐ Draw Annotations with Leader from Rim Position
- ☐ Draw Annotations with Leader from Invert Position
- ☐ Draw Annotations with Attribute Block
- ☐ Tick Mark for Station
- ☐ Project Invert In/Out Elev at Manhole Center
- ☐ Station Manholes By Another Centerline
- ☐ Draw Sump — Sump Height: 0.00
- ☐ Draw Base — Base Height: 0.00

The sewer structure or pipe profile labels can be drawn in the following four styles:

Draw Horiz Axis Annotations: Labels structure or pipe profile along the horizontal axis.

Draw Annotations Above Rim: Creates structure or pipe profile labels above the rim of manholes.

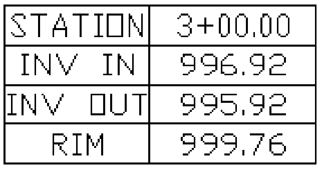

Sewer Label Settings

Available Labels
- Reference CL Offset
- Manhole Name
- Description
- Pipe Size
- Pipe Material
- Structure ID
- Inlet Type

Used Labels	Row
Station	1
Invert-In Elev	2
Invert-Out Elev	3
Rim Elev	4

☑ Use Data Table
Label Width 7.00
Value Width 8.00
Text Orientation: ● Horizontal ○ Vertical
Sewer Label Position: ○ Pick Row ● Above Manhole
Text Justify Center
Label Offset 0.00
Vertical Line None
Position At Center of Structure

Here is an example of using the Data Table option for the labels:



STATION	3+00.00
INV IN	996.92
INV OUT	995.92
RIM	999.76

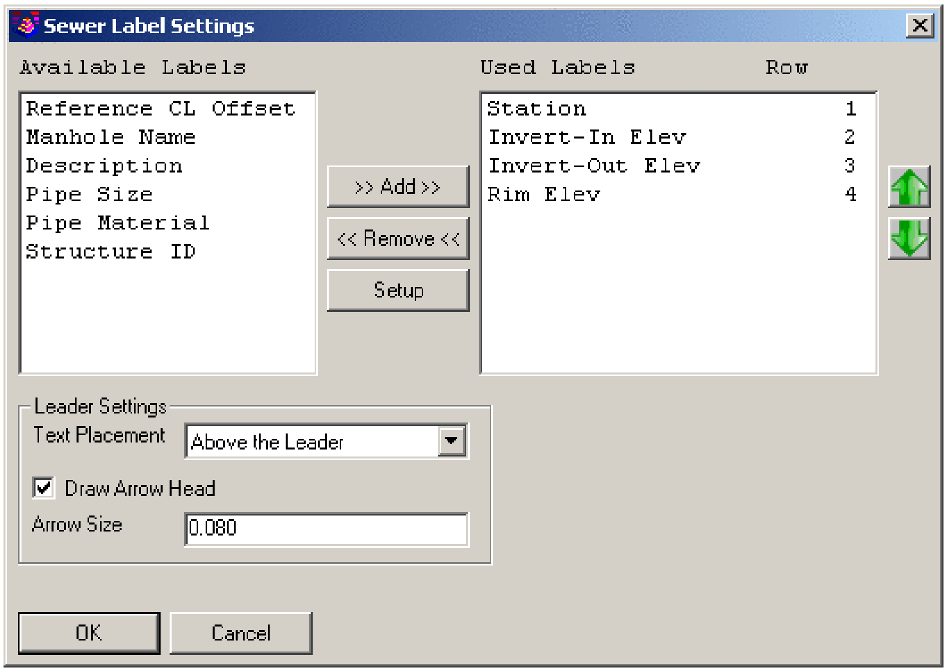
Draw Annotations Below Invert: Creates structure or pipe profile labels below the rim of manholes.

Draw Annotations with Leader from Rim Position: Creates structure or pipe profile labels with a leader from manhole's rim position.

Draw Annotations with Leader from Invert Position: Creates structure or pipe profile labels with a leader from manhole's invert position.

Draw Annotations with Attribute Block: Inserts blocks with attributes for the structure or pipe labels.

Each style has a setup dialog to specify which labels are to be created and in what order. For labels with leaders, you can setup the leader styles.



Sewer Label Settings

Available Labels

- Reference CL Offset
- Manhole Name
- Description
- Pipe Size
- Pipe Material
- Structure ID

Used Labels	Row
Station	1
Invert-In Elev	2
Invert-Out Elev	3
Rim Elev	4

Leader Settings

Text Placement: Above the Leader

☑ Draw Arrow Head

Arrow Size: 0.080

Tick Mark for Station: Draws a tick mark at every station.

Project Invert In/Out Elev at Manhole Center: The Invert In/Out elevations are not the actual values, but are projected elevations to the manhole center.

Station Manholes by Another Centerline: This option will make new station for each manhole by referencing the profile to another centerline, for example a road centerline.

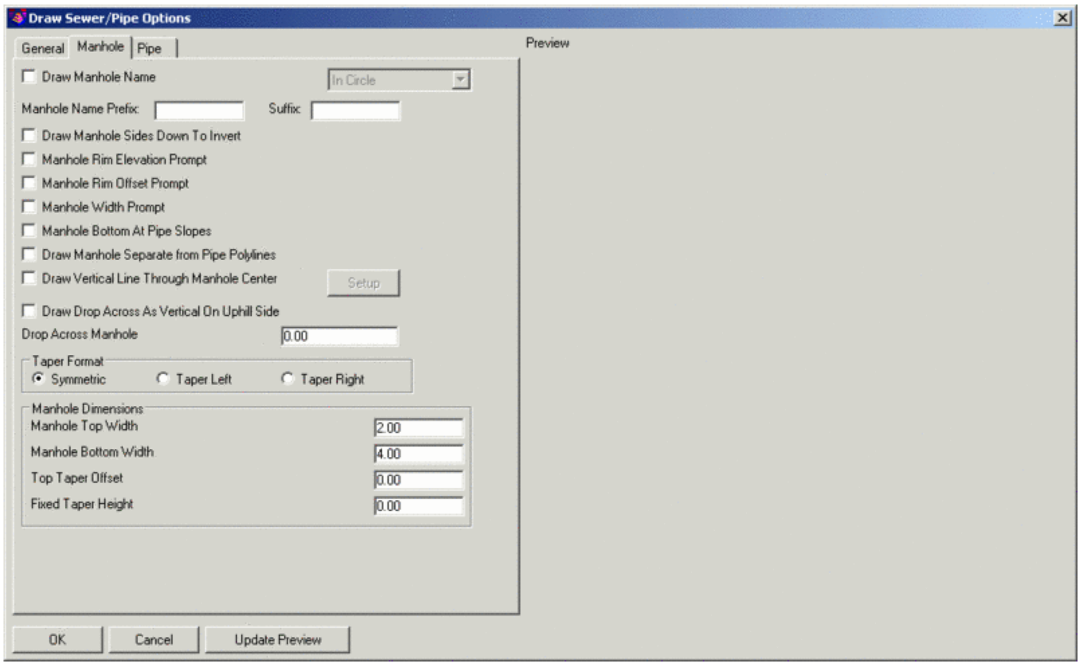
Draw Sump: When enabled, specify the height of the sump to be drawn into the sewer profile.

Draw Base: When enabled, specify the base height to be drawn into the sewer profile.

Label Precision: Click on the Label Precision button to set the amount of precision used for sewer station, elevation, length and slope labels.

Manhole Tab

On this tab, you are able to specify how to label the manhole name and how to draw the manholes.



Draw Sewer/Pipe Options

☐ Draw Manhole Name — In Circle

Manhole Name Prefix: Suffix:

☐ Draw Manhole Sides Down To Invert

☐ Manhole Rim Elevation Prompt

☐ Manhole Rim Offset Prompt

☐ Manhole Width Prompt

☐ Manhole Bottom At Pipe Slopes

☐ Draw Manhole Separate from Pipe Polylines

☐ Draw Vertical Line Through Manhole Center

☐ Draw Drop Across As Vertical On Uphill Side

Drop Across Manhole: 0.00

Taper Format: ● Symmetric ○ Taper Left ○ Taper Right

Manhole Dimensions

Manhole Top Width	2.00
Manhole Bottom Width	4.00
Top Taper Offset	0.00
Fixed Taper Height	0.00

Draw Manhole Name: Enable this option and select the desired geometric shape that shall circumscribe the manhole name. If selected, enter any desired prefix or suffix for the labels.

Draw Manhole Sides Down To Invert: Closes the manhole at pipes.

Manhole Rim Elevation Prompt: Ignores the manhole's rim elevation and prompts to enter new values.

Manhole Rim Offset Prompt: Prompts to enter the offset value and adds the offset to the manhole's rim elevation.

Manhole Width Prompt: Enable this option to prompt for the top width of the manhole.

Manhole Bottom at Pipe Slopes: Enable this option to prompt for the bottom width of the manhole.

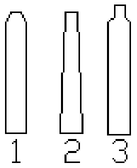
Draw Manhole Separate from Pipe Polylines: Enable this option to draw the shape of the manhole as a separate polyline from that of the pipe.

Draw Vertical Line Through Manhole Center: Draws a vertical line through the manhole center from rim to bottom of profile grid.

Draw Drop Across As Vertical On Uphill Side: If a step up is used, draws this as a vertical line on the higher side of the structure.

Drop Across Manhole: Adds a step up to the invert-in elevation.

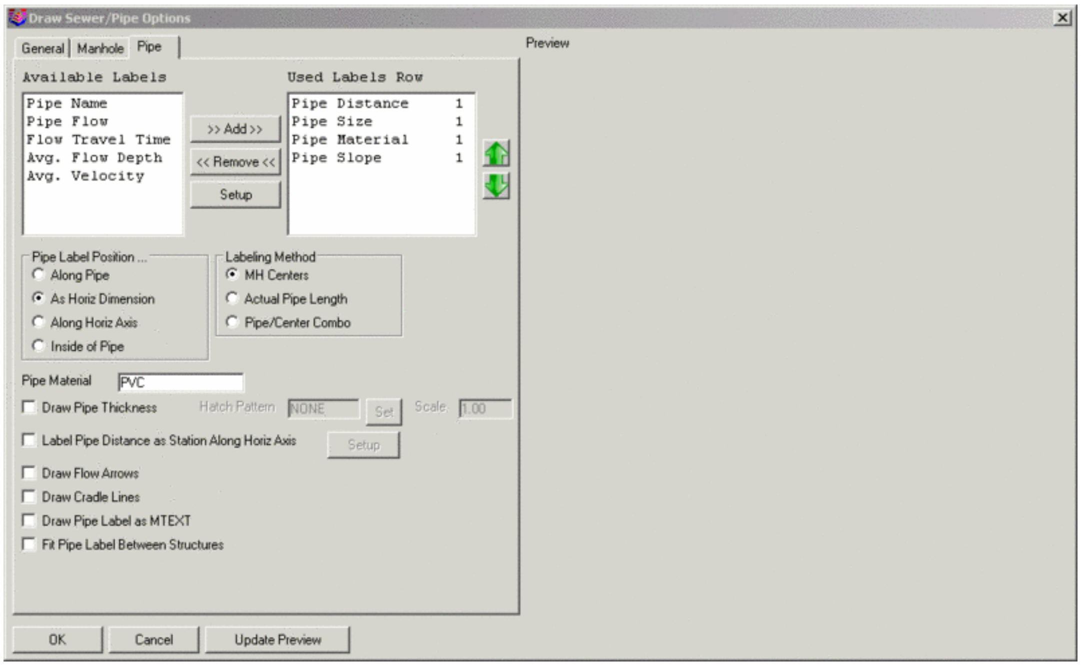
Taper Format, Manhole Dimensions: When drawing from a profile file created with the Design Sewer/Pipe Profile command, these parameters are used to define the manhole shape and dimension. When drawing from a profile created from Network in the Hydrology module with commands such as Export to Profiles, these Draw Profile settings are ignored and the dimensions come from the Network instead. The taper settings are used for transitioning between different manhole top and bottom widths. The Top Taper Offset sets the distance from the top of the manhole to the point that the taper will end. The Fixed Taper Height determines the overall length of the tapered section.



In this example image, all the manholes have Top Width of 2 and Bottom Width of 4. Manhole #1 has Top Taper Offset of 2 and Fixed Taper Height of 0. Manhole #2 has Top Taper Offset of 100 and Fixed Taper Height of 0. This large Top Taper Offset is greater than the manhole depth so that the taper runs the full length of the manhole. Manhole #3 has Top Taper Offset of 3 and Fixed Taper Height of 1.

Pipe Tab

Here you can choose to label pipe in a very flexible order. Each label has a setup function which specifies the label prefix and suffix, decimal places, row number and etc.



Draw Sewer/Pipe Options

General | Manhole | Pipe

Preview

Available Labels

- Pipe Name
- Pipe Flow
- Flow Travel Time
- Avg. Flow Depth
- Avg. Velocity

Used Labels Row

Pipe Distance	1
Pipe Size	1
Pipe Material	1
Pipe Slope	1

Pipe Label Position ...

○ Along Pipe
● As Horiz Dimension
○ Along Horiz Axis
○ Inside of Pipe

Labeling Method

● MH Centers
○ Actual Pipe Length
○ Pipe/Center Combo

Pipe Material: PVC

☐ Draw Pipe Thickness   Hatch Pattern: NONE   Scale: 1.00

☐ Label Pipe Distance as Station Along Horiz Axis

☐ Draw Flow Arrows
☐ Draw Cradle Lines
☐ Draw Pipe Label as MTEXT
☐ Fit Pipe Label Between Structures

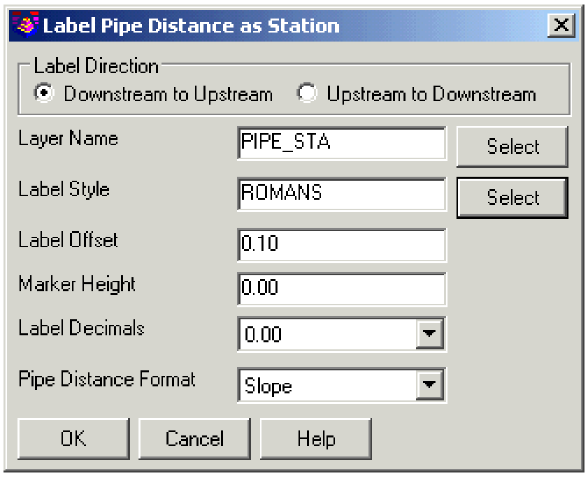
Pipe Label Position: Indicate the preferred location for pipe labels.

Labeling Method: Indicate the preferred method for determining the length of the pipe.

Pipe Material: Indicate the type of material used for the pipe.

Draw Pipe Thickness: When selected, draws pipes in profile as double lines indicating the thickness of the pipe. This option also allows for cross hatching of the double lines.

Label Pipe Distance as Station Along Horiz Axis: This option creates pipe distance labels as the station style along the horizontal axis. Click the **Setup** button to access the labeling method and style.



Label Pipe Distance as Station

Label Direction

● Downstream to Upstream   ○ Upstream to Downstream

Layer Name: PIPE_STA

Label Style: ROMANS

Label Offset: 0.10

Marker Height: 0.00

Label Decimals: 0.00

Pipe Distance Format: Slope

Draw Flow Arrows: Indicate if arrows should be drawn illustrating the direction of flow.

Draw Cradle Lines: If the sewer profile contains cradle data, this option would draw cradle lines above and below the pipe segments.

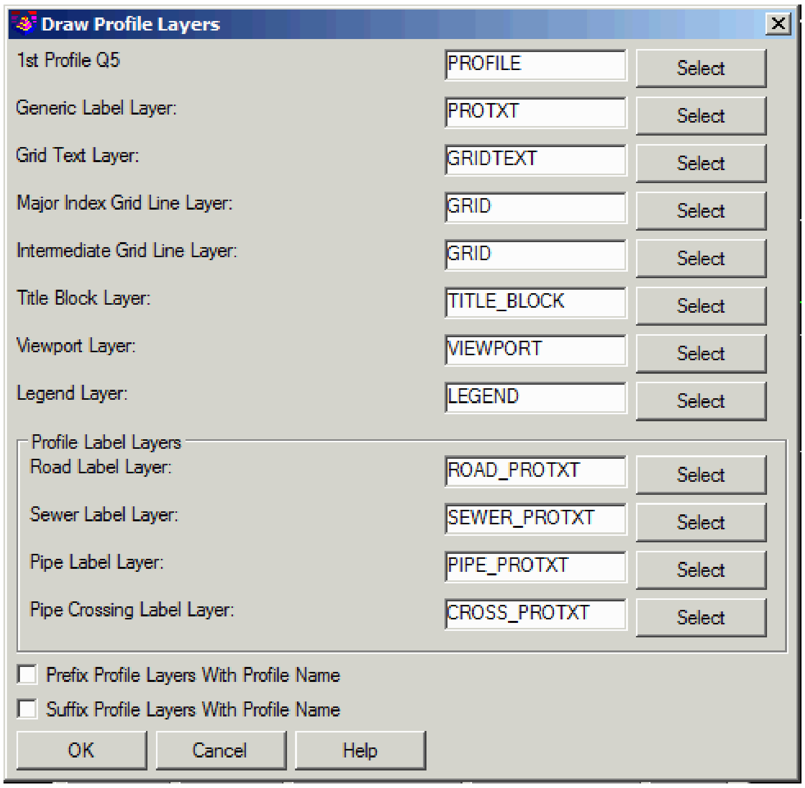
Draw Pipe Label as MTEXT: When enabled, text labels will be drawn as a *multiline text* (MTEXT) entity.

Fit Pipe Label Between Structures: When enabled, this option will ensure that pipe labels will fall within a structure-to-structure distance.

General Settings

Layers

The Layers button has the layer names for the profile lines, profile grid and general labels.



Draw Profile Layers

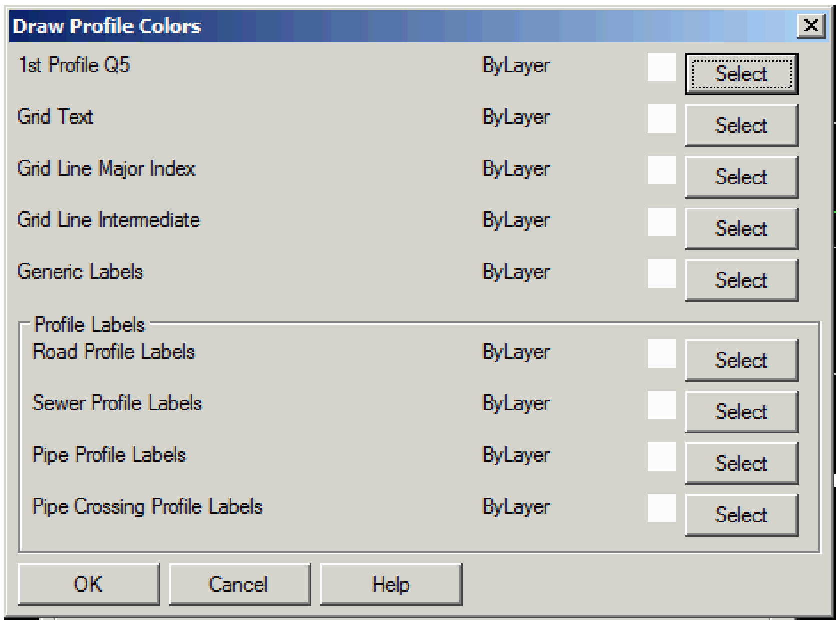
1st Profile Q5	PROFILE
Generic Label Layer:	PROTXT
Grid Text Layer:	GRIDTEXT
Major Index Grid Line Layer:	GRID
Intermediate Grid Line Layer:	GRID
Title Block Layer:	TITLE_BLOCK
Viewport Layer:	VIEWPORT
Legend Layer:	LEGEND
Profile Label Layers	
Road Label Layer:	ROAD_PROTXT
Sewer Label Layer:	SEWER_PROTXT
Pipe Label Layer:	PIPE_PROTXT
Pipe Crossing Label Layer:	CROSS_PROTXT

☐ Prefix Profile Layers With Profile Name

☐ Suffix Profile Layers With Profile Name

Colors

The Colors button has the colors for the profile lines, profile grid and general labels.

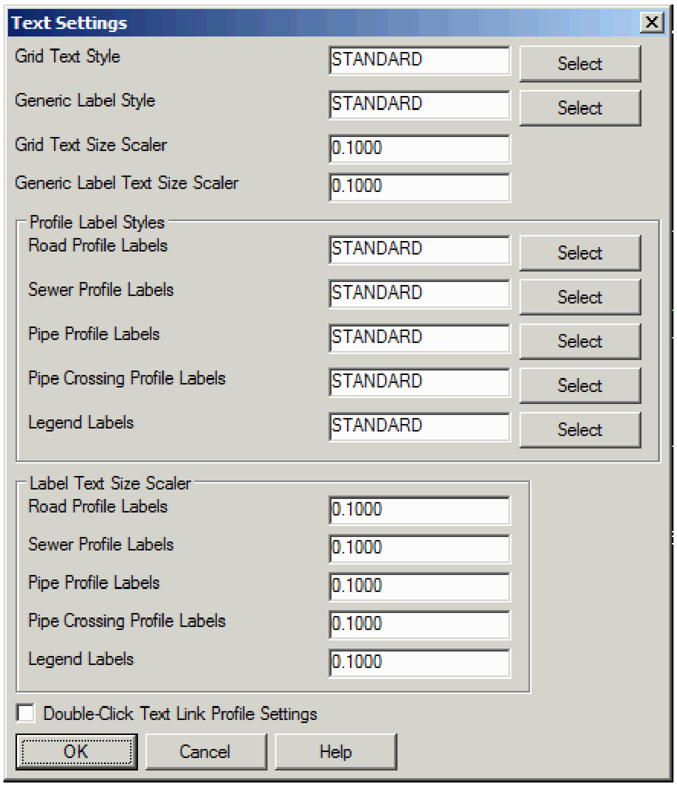


Draw Profile Colors

1st Profile Q5	ByLayer
Grid Text	ByLayer
Grid Line Major Index	ByLayer
Grid Line Intermediate	ByLayer
Generic Labels	ByLayer
Profile Labels	
Road Profile Labels	ByLayer
Sewer Profile Labels	ByLayer
Pipe Profile Labels	ByLayer
Pipe Crossing Profile Labels	ByLayer

Text Settings

The Text Settings button has the text style and size scalers for profile grid and general labels. The size scalers are multiplied by the profile horizontal scale to determine the text size in drawing units. The Double-Click Text Link Profile Settings controls whether double-click on the profile text in the drawing brings up the Draw Profile Settings for that text or runs the action set in the CAD such as edit text.



Grid Text Style: STANDARD
Generic Label Style: STANDARD
Grid Text Size Scaler: 0.1000
Generic Label Text Size Scaler: 0.1000

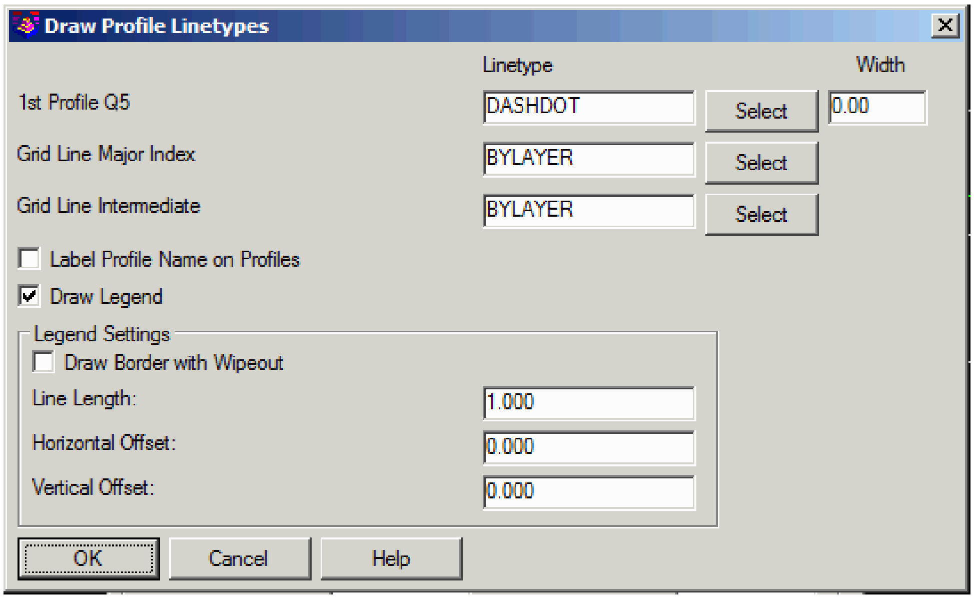
Profile Label Styles
Road Profile Labels: STANDARD
Sewer Profile Labels: STANDARD
Pipe Profile Labels: STANDARD
Pipe Crossing Profile Labels: STANDARD
Legend Labels: STANDARD

Label Text Size Scaler
Road Profile Labels: 0.1000
Sewer Profile Labels: 0.1000
Pipe Profile Labels: 0.1000
Pipe Crossing Profile Labels: 0.1000
Legend Labels: 0.1000

☐ Double-Click Text Link Profile Settings

Linetypes

The Linetypes button has linetype settings for the profile line and profile grid. There are also settings for drawing a profile legend of the profile lines.


Draw Profile Linetypes

	Linetype		Width
1st Profile Q5	DASHDOT	Select	0.00
Grid Line Major Index	BYLAYER	Select	
Grid Line Intermediate	BYLAYER	Select	

☐ Label Profile Name on Profiles

☑ Draw Legend

Legend Settings

☐ Draw Border with Wipeout

Line Length: 1.000

Horizontal Offset: 0.000

Vertical Offset: 0.000

Back

Allows you to return to the previous dialog box to alter or adjust the information it provides.

Load Settings

Loads a saved collection of Draw Profile settings, saved in a (.PFS) file.

Save Settings

Saves all Draw Profile settings in a (.PFS) file.

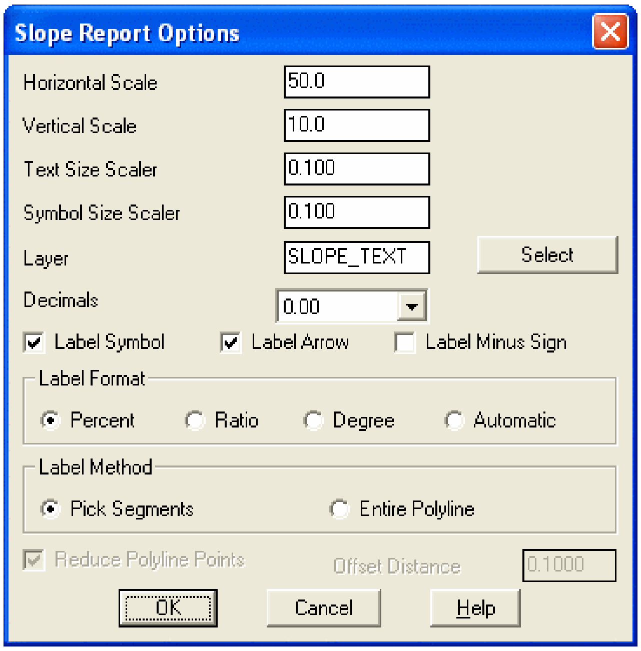
Prompts (may vary based on Settings)

Polyline should be drawn in direction of increasing stations.
CL File/<Select pipe crossings on-the-fly or parallel pipes centerline>: Pick a polyline upon which to base the stationing or *Type C to select an existing Centerline .CL file and then press Enter*
Centerline Starting Station <0.0>: *Press Enter to accept the default station value specified* or *Type in the beginning station then press Enter*

Pulldown Menu Location(s): Civil > Profiles, Survey > Surface, Field > Roads
Keyboard Command: drawprof
Prerequisite: A profile .PRO file

Profile Slope Report

This command calculates and labels the slope of a line, polyline segment, an entire polyline, or pair of points, as drawn on a profile. The command starts with the Slope Report Options dialog.

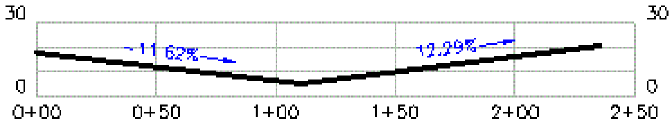


Horizontal Scale: 50.0
Vertical Scale: 10.0
Text Size Scaler: 0.100
Symbol Size Scaler: 0.100
Layer: SLOPE_TEXT
Decimals: 0.00
☑ Label Symbol ☑ Label Arrow ☐ Label Minus Sign
Label Format: ● Percent ○ Ratio ○ Degree ○ Automatic
Label Method: ● Pick Segments ○ Entire Polyline
☑ Reduce Polyline Points
Offset Distance: 0.1000

Horizontal Scale: Specify the horizontal scale of the profile.
Vertical Scale: Specify the vertical scale of the profile.
Text Size Scaler: Specify the text size scaler.
Decimals: Specify the display precision for the slope labels.
Label Symbol: When checked, the degree symbol or percent sign will be used in the label.
Label Arrow: When checked, a slope direction arrow will be included.
Label Minus Sign: Will label a minus sign on negative slopes.
Label Format: Specify how to label the profile slopes. The automatic settings means to use a percent label for any slope less than 10%. and a ratio for any slope greater that 10%.
Label Method: Choose to label the entire profile at once or to pick individual segments.
Reduce Profile Points: When checked, the number of labels created on the profile will be reduced based on the Offset Distance value. Applies only to the Entire Polyline selection option..
Offset Distance: Specify maximum offset between profile vertices. Only available when Reduce Profile Points toggle is checked on.

Prompts

Slope Report Options dialog box
Points/<Select line or polyline to list-label>: *pick a polyline*
Slope Distance> 600.33 Horizontal Distance> 600.00
Elevation Difference: 20.00 Slope Ratio: 30.00:1 Slope Percent: 3.33
Starting point of label ([Enter] for none): *pick a point*
Points/<Select line or polyline to list-label>: *press Enter* If you choose P for points, you go into the Points mode and can label the slope of any pair of screen picks on the profile.

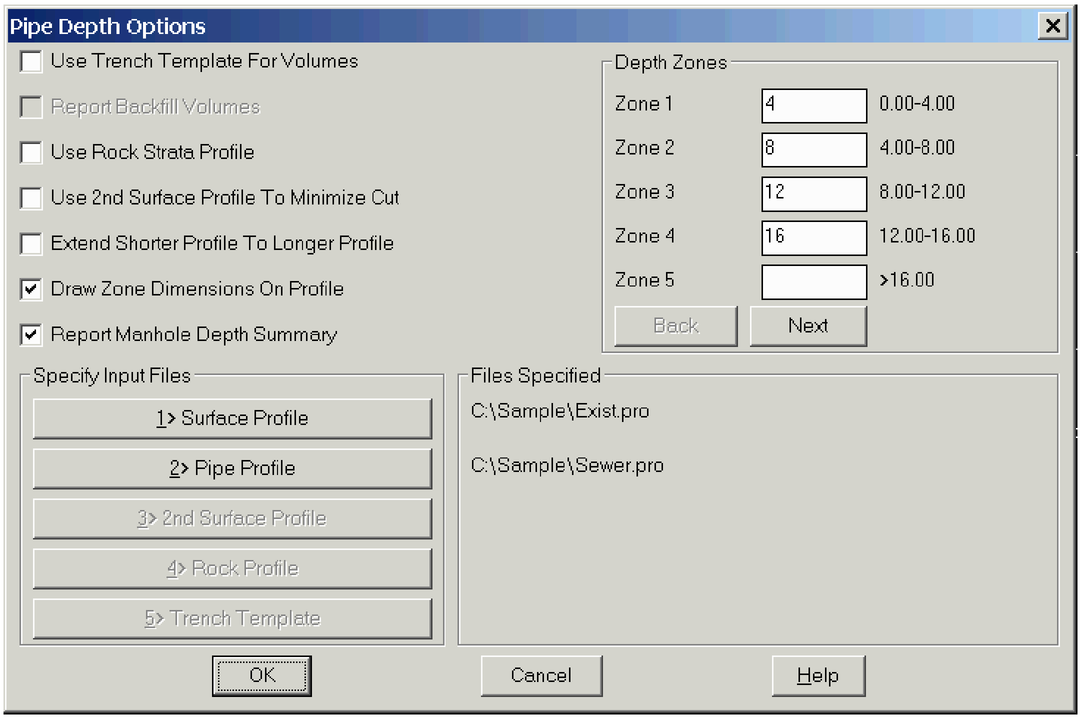


Keyboard Command: llg
Prerequisite: A profile grid and profile polyline

Pipe Depth Summary

This command reports the horizontal distances for the range of depths comparing a surface profile to a trench, pipe or sewer profile. There is an option to use two surface profiles and the program will use the minimum of the two depths. In addition to the report, the depth ranges can be labeled along the profile in the drawing.

The simplest of applications of this command, comparing a sewer profile to a surface profile and reporting the depth summary according to the specified Depth Zones, is shown below.



Pipe Depth Options

☐ Use Trench Template For Volumes
☐ Report Backfill Volumes
☐ Use Rock Strata Profile
☐ Use 2nd Surface Profile To Minimize Cut
☐ Extend Shorter Profile To Longer Profile
☑ Draw Zone Dimensions On Profile
☑ Report Manhole Depth Summary

Depth Zones

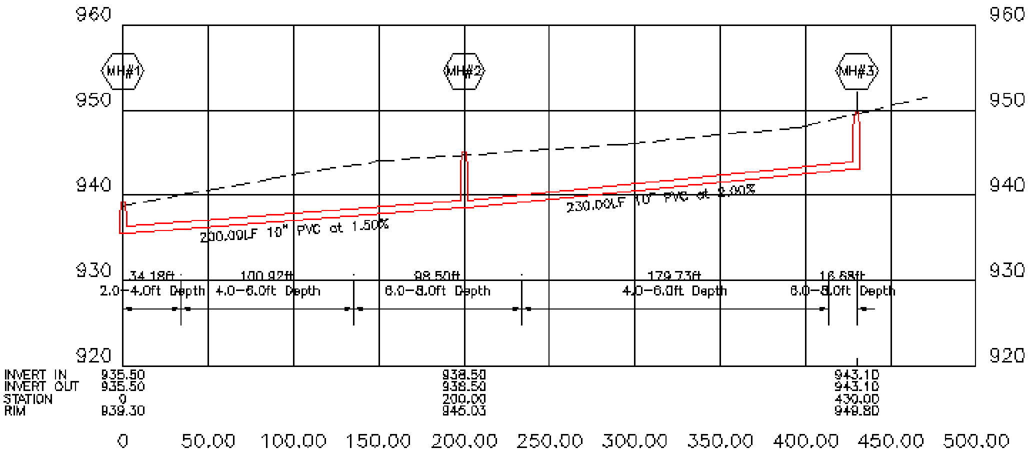
Zone 1	4	0.00-4.00
Zone 2	8	4.00-8.00
Zone 3	12	8.00-12.00
Zone 4	16	12.00-16.00
Zone 5		>16.00

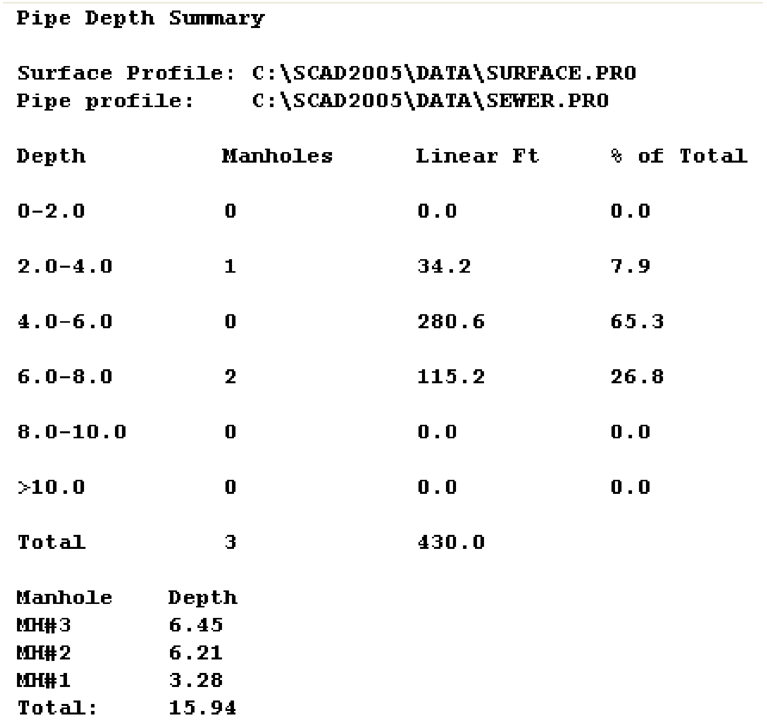
Files Specified
C:\Sample\Exist.pro
C:\Sample\Sewer.pro

Use Trench Template for Volumes: Trench templates are made using the command Input-Edit Trench Template within the Profile Utilities "flyout". Trench earthwork volumes are then computed.
Report Backfill Volumes: Available if trench templates is clicked on.
Use Rock Strata Profile: If clicked on, the Rock Profile can be entered in the lower portion of the dialog, and if the pipe invert is below rock surfaces along any segment, rock linear feet will be reported, in the same depth categories as used for trench depths. In the example shown below, if rock depth is uniformly 5 feet below surface elevation, in the form of a rock profile, rock quantities are 348 feet of 0-2 feet depth of rock trenching.
Use 2nd Surface Profile to Minimize Cut: If the final grade is below existing grade, in those areas, it saves trenching work to first do the cut to final grade, prior to filling over existing grade in areas of fill. Then trench depths are minimized. This option, if clicked on, computes trench depths to the minimum of the two specified surfaces, and activates the 2nd Surface Profile option in the lower portion of the dialog.
Extend Shorter Profile to Longer Profile: This option will extrapolate the starting and ending stations of the shorter profile to match the longer profile.
Draw Zone Dimensions on Profile: The depth zones will be annotated along the horizontal axis of a profile drawing with this option.
Report Manhole Depth Summary: This leads to the depth summary report.
Depth Zones: These zones are for reporting the pipe range of depth. The depths should be entered in lowest to highest order. Use the Next and Back buttons to move between the 20 possible depth values.

Prompts

Pipe Depth Options dialog
Pick lower left grid corner [int on]: *pick the profile grid corner*
Pick vertical position for dimensions: *pick a point below the profile grid*


960
950
940
930
920
MH#1
MH#2
MH#3
200.00LF 10" PVC at 1.50%
230.00LF 10" PVC at 2.00%
34.18ft
100.92ft
98.50ft
179.73ft
16.68ft
2.0-4.0ft Depth
4.0-6.0ft Depth
6.0-8.0ft Depth
4.0-6.0ft Depth
6.0-8.0ft Depth
INVERT IN
INVERT OUT
STATION
RIM
935.50
935.50
0
939.30
938.50
938.50
200.00
945.03
943.10
943.10
430.00
949.80
0
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
450.00
500.00



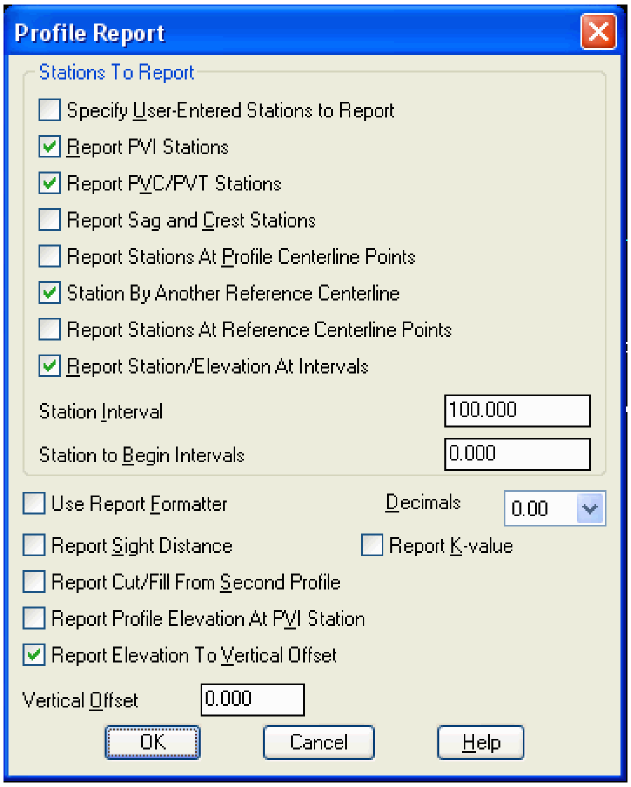
```
Pipe Depth Summary

Surface Profile: C:\SCAD2005\DATA\SURFACE.PRO
Pipe profile:    C:\SCAD2005\DATA\SEWER.PRO

Depth          Manholes      Linear Ft     % of Total

0-2.0          0             0.0           0.0

2.0-4.0        1             34.2          7.9

4.0-6.0        0             280.6         65.3

6.0-8.0        2             115.2         26.8

8.0-10.0       0             0.0           0.0

>10.0          0             0.0           0.0

Total          3             430.0

Manhole     Depth
MH#3        6.45
MH#2        6.21
MH#1        3.28
Total:      15.94
```

Pulldown Menu Location: Profiles
Keyboard Command: pipedeep
Prerequisite: Two profiles, one for the surface and one for the pipe invert elevation

Profile Report

This command creates a summary report of generic, road, crossing, pipe and sewer profiles using a profile file (.PRO file). The report is generated in the standard report viewer which can print the report, save it to a file or draw it on the screen. The different types of profiles have different report options.

For roadway profiles, Report Sag and Crest Stations will calculate and report sag and crest stations and elevations. Report Stations at Centerline Points will prompt the user for a centerline file (.cl file) and report stations and elevations at horizontal PC and PT points. Report Cut/Fill from Second Profile will compute and report the elevation difference between the subject profile and a second reference profile. Report Min/Max Cut/Fill reports the stations and amounts for the min and max cut and fill between the road and reference profiles. Report Station/Elevation at Interval will calculate and report stations at the specified interval in addition to other points. Report Elevation to Vertical Offset creates and additional elevation column in the report. The differential amount for this column is specified by the user in the Vertical Offset window. The Use Report Formatter option runs the report through the report formatter where you can choose which fields to report and the report order as well as output to Excel or databases.



Profile Report

Stations To Report

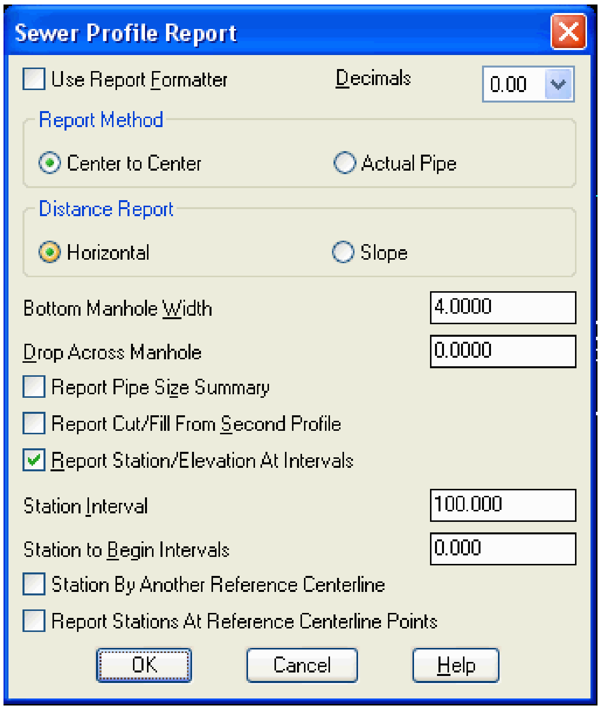
☐ Specify User-Entered Stations to Report
☑ Report PVI Stations
☑ Report PVC/PVT Stations
☐ Report Sag and Crest Stations
☐ Report Stations At Profile Centerline Points
☑ Station By Another Reference Centerline
☐ Report Stations At Reference Centerline Points
☑ Report Station/Elevation At Intervals

Station Interval: 100.000
Station to Begin Intervals: 0.000

☐ Use Report Formatter
Decimals: 0.00
☐ Report Sight Distance
☐ Report K-value
☐ Report Cut/Fill From Second Profile
☐ Report Profile Elevation At PVI Station
☑ Report Elevation To Vertical Offset

Vertical Offset: 0.000

For sewer profiles, the Report Method chooses between reporting the slopes and pipe distances between manhole centers or from the outside manhole edges for the actual pipe dimensions. The Report Pipe Size Summary option reports the total pipe length for each different pipe size. The Station By Another Reference Centerline option reports the sewer stations using a reference alignment besides the sewer alignment. For example, this option can be used to report the sewer stations based on the road centerline. When this option is on, the program will prompt for both the sewer centerline and the reference centerline. The program first finds the position of the sewer station along the sewer centerline and then finds the station of the nearest perpendicular offset along the reference centerline.



Sewer Profile Report

☐ Use Report Formatter

Decimals: 0.00

Report Method

● Center to Center ○ Actual Pipe

Distance Report

● Horizontal ○ Slope

Bottom Manhole Width: 4.0000

Drop Across Manhole: 0.0000

☐ Report Pipe Size Summary

☐ Report Cut/Fill From Second Profile

☑ Report Station/Elevation At Intervals

Station Interval: 100.000

Station to Begin Intervals: 0.000

☐ Station By Another Reference Centerline

☐ Report Stations At Reference Centerline Points

Prompts

Specify a Profile File dialog Choose the .PRO file.
Profile Report dialog Make selections, click OK.
If a vertical offset is entered, a second column of elevations is reported.

Sample Profile Report:

```
Profile Report
Road Profile
Station Elevation Type VertCurve Distance Slope Desc
0+00.00 88.08          0.00
1+00.00 94.39                              6.45%
2+00.00 100.84                             6.45%
3+00.00 107.29                             6.45%
3+73.78 112.05    PVC            371.48    6.45%
4+00.00 113.68                             6.00%
5+00.00 118.82                             4.27%
6+00.00 122.22                             2.54%
6+23.78 128.18    PI   350.00    250.00    6.45%
7+00.00 121.26                             -6.10%
7+23.78 119.50    PVT            100.00    -8.67%
7+75.71 115.00         0.00      51.93     -8.67%
```

Pulldown Menu Location: Profiles
Keyboard Command: preport
Prerequisite: A .PRO file

Quick Section

This command creates section files in one step. The horizontal alignment for the sections can be defined by using picked points, a centerline file or a polyline. A section alignment (.MXS) file is not required for this routine. 3D screen entities or surface files (.GRD, .FLT, or .TIN) are used to define the vertical alignment.

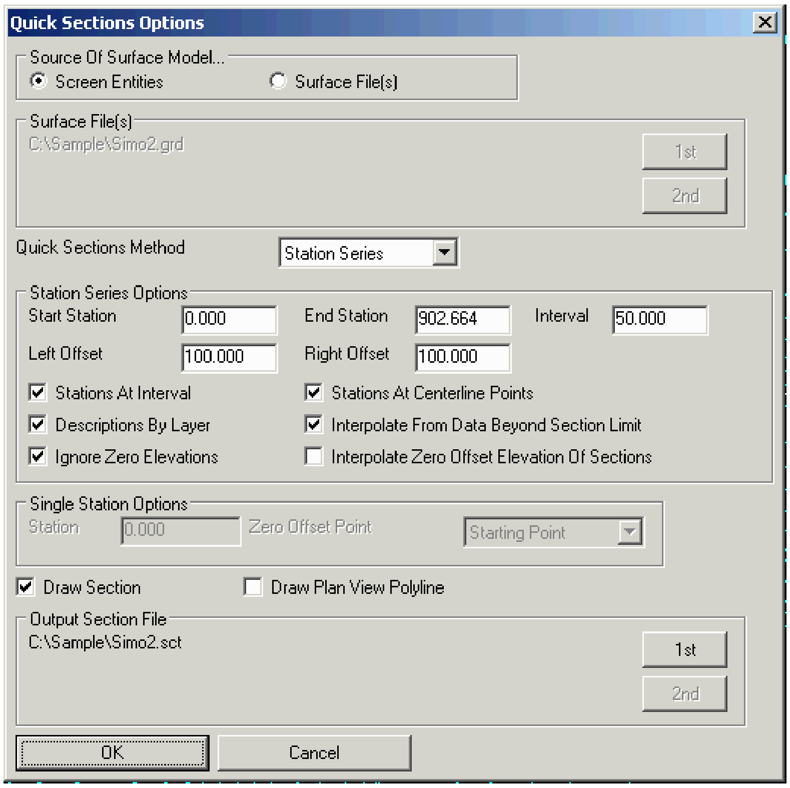
There are two options under Quick Section Methods. The Station Series method creates sections perpendicular from the horizontal alignment at a station interval. In this case, the horizontal alignment represents the centerline. The Single Station method creates one section along the horizontal alignment appends this section to the output section file. In this case, the horizontal alignment represents the alignment of the section.

For the Station Series method, there are settings for the Start Station of the horizontal alignment, the End Station to stop creating sections, the Interval for the stations, and the Left and Right Offsets to define the section width. There are also options to control the section stations to create. The Stations At Interval option will create sections at the specified station interval. The Stations At Centerline Points option will create sections at the special stations of the centerline for the centerline transitions such as PC, PT points

For the Single Station method, the Station value is assigned to this section. The Zero Offset Point chooses between using the starting point of the horizontal alignment as the zero offset or selecting a point along the alignment as the zero offset.

With the Source Of Surface Model set to Surface Files, the program prompts for up to two surface files so that up to two section files can be generated at a time. When the Surface Model is set to Screen Entities, only one section file is created from the screen entities. With Screen Entities, there are a few more options. The Descriptions By Layer option will use the layers of the screen entities as the descriptions for the section points. The Interpolate From Data Beyond Section Limit will check for intersections with the section line and the screen entities beyond the left/right offsets to interpolate the elevations at the left/right offset extents. The Ignore Zero Elevations will filter out screen entities that are at zero elevation. The Interpolate Zero Offset Elevation Of Sections will create a section point at offset zero by interpolating between the nearest section points.

The program requires an output section file to store the results. There is an output option to draw the sections which calls the Draw Section File command. Finally, the option to Draw Plan View Polyline will draw the horizontal alignment as a polyline which is especially useful is the method to define the alignment by picked points was used.



Source Of Surface Model...
● Screen Entities ○ Surface File(s)

Surface File(s)
C:\Sample\Simo2.grd

Quick Sections Method: Station Series

Station Series Options
Start Station: 0.000
End Station: 902.664
Interval: 50.000
Left Offset: 100.000
Right Offset: 100.000
☑ Stations At Interval
☑ Stations At Centerline Points
☑ Descriptions By Layer
☑ Interpolate From Data Beyond Section Limit
☑ Ignore Zero Elevations
☐ Interpolate Zero Offset Elevation Of Sections

Single Station Options
Station: 0.000
Zero Offset Point: Starting Point

☑ Draw Section ☐ Draw Plan View Polyline

Output Section File
C:\Sample\Simo2.sct

Prompts

Pick starting point (CL-Centerline,P-Polyline): *select a point*

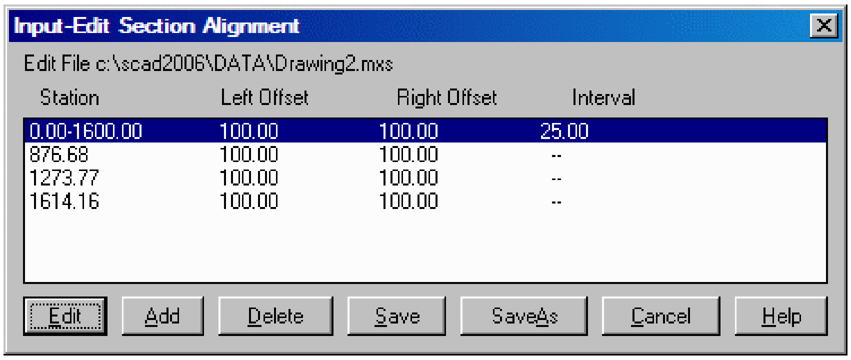
Pick second point: *select second point*
Pick next point (Enter to end): *press Enter*
Quick Section Options dialog
Choose Source of Surface Model, Screen Entities or Surface File, and make other selections. Click OK.

Keyboard Command: quicksct
Prerequisite: 3D Screen entities or surface files

Input-Edit Section Alignment

This command will create or append to a section alignment file which is stored as a Multiple Cross Sections (.MXS) file. This file contains the coordinates that define the center and endpoints of section lines and is a requirement of many section commands such as *Sections from Surface Entities* and *Sections to 3D Polyline.* The section alignment defines the stations along a centerline and how far left and right to create cross sections. This routine starts by asking for a new or existing .MXS file name. Then the centerline is specified by either by choosing a centerline file (.CL file) or selecting a polyline that represents the centerline. Next, the program prompts for the starting station of the centerline. If this is a new section alignment, the Make MXS File Settings dialog appears.

The Input-Edit Section Alignment dialog lists all the section stations and offsets in the alignment of an existing .MXS file.

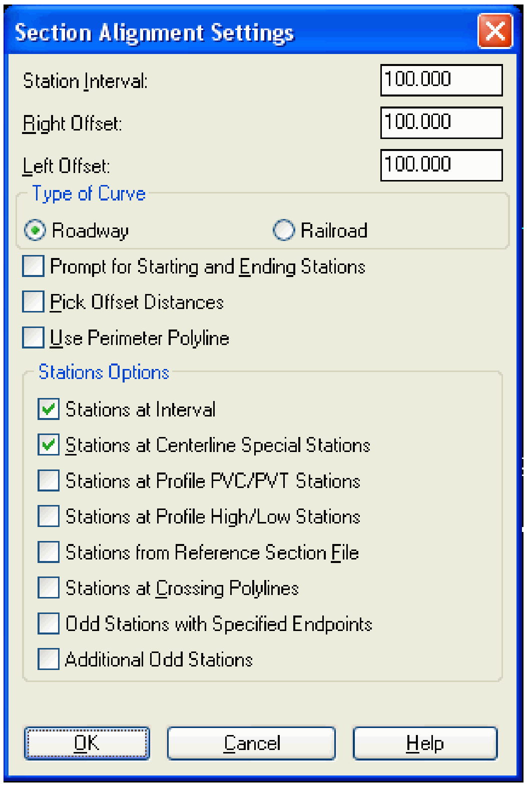


Edit File c:\scad2006\DATA\Drawing2.mxs

Station	Left Offset	Right Offset	Interval
0.00-1600.00	100.00	100.00	25.00
876.68	100.00	100.00	--
1273.77	100.00	100.00	--
1614.16	100.00	100.00	--

Dialog if using an existing .MXS file

Edit: Allows you to edit the currently highlighted row.
Add: Allows you to add more sections by displaying the Make MXS File Settings dialog (shown below).
Delete: Deletes the currently highlighted row.
Save: Saves the MXS file, exits this dialog and draws the section alignment on the screen using temporary vectors (yellow for left offsets, magenta for right offsets). Any viewport change such as *Redraw* or *Zoom* will cause these vectors to disappear. The draw the section lines with Line entities, use the *Draw Section Alignment* command.
SaveAs: Saves a new MXS file with a user-specified name.



Station Interval: 100.000

Right Offset: 100.000

Left Offset: 100.000

Type of Curve

● Roadway ○ Railroad

☐ Prompt for Starting and Ending Stations

☐ Pick Offset Distances

☐ Use Perimeter Polyline

Stations Options

☑ Stations at Interval

☑ Stations at Centerline Special Stations

☐ Stations at Profile PVC/PVT Stations

☐ Stations at Profile High/Low Stations

☐ Stations from Reference Section File

☐ Stations at Crossing Polylines

☐ Odd Stations with Specified Endpoints

☐ Additional Odd Stations

Dialog used for a new section alignment

Station Interval: Enter the station interval for sections.
Right Offset: Enter the width for the sections, right of the centerline. Not available if Pick Offset Distances is checked.
Left Offset: Enter the width for the sections, left of the centerline. Not available if Pick Offset Distances is checked.
Type of Curve: Specify either Roadway or Railroad curve to account for the differences in stationing curves.
Prompt for Starting and Ending Stations: This option allows you to specify the range of stations to process. Otherwise the program will use the full station range of the centerline.
Pick Offset Distances: Allows you to specify the offsets by using the distance between two picked points in the drawing.
Use Perimeter Polyline: Allows you to specify a closed polyline that will be used as the limit of the cross sections. The offsets will be contained within this closed polyline.
Stations at Interval: Creates cross sections at the specified interval such as every 25 feet. If the Prompt for Starting and Ending Stations is on, then the program will apply the station interval to the user-specified range of stations. Otherwise the station interval is used along the entire centerline.
Stations at Centerline Special Stations: Creates cross sections at every transition point in the centerline such as the PC, PT, spiral points and end points.
Stations at Profile PVC/PVT Stations: Creates cross sections at profile vertical curve transitions stations. When active, the program will prompt for the profile to process.
Stations at Profile High/Low Stations: Creates cross sections at profile vertical curve high and/or low stations. When active, the program will prompt for the profile to process.
Stations from Reference Section File: Creates cross sections at stations contained in the reference section file. When active, the program will prompt for the section file to process.
Stations at Crossing Polylines: Allows you to select polylines that cross the centerline and creates cross sections at the intersections of these polylines with the centerline.
Odd Stations with Specified Endpoints: Creates cross sections at stations that are entered or at picked points along the centerline. This option also allows you to pick the left and right offset points which do not have to be perpendicular to the centerline.
Additional Odd Stations: Creates cross sections at the specified stations but the offsets are always perpendicular to the centerline with the user-defined default offset distances.
Use Exclusion Areas: This option prompts for selecting closed polylines to use as exclusion areas which are areas

to skip for the section surface. The stations and offsets for the exclusion areas are stored in the section alignment file. Then routines like Calculate Section Volumes and Draw Sections will skip over these areas and not calculate volumes or draw section lines in these areas.

Prompts

Specify an MXS file dialog Choose new or existing.
Polyline should have been drawn in direction of increasing stations.
CL File/<Select polyline that represents centerline>: *pick centerline*
Enter Beginning Station of Alignment <0.00>: *press Enter*

Pulldown Menu Location: Sections
Keyboard Command: editmxs
Prerequisite: A polyline centerline or a centerline .CL file

Sections From Existing Surface

This command will create a section file (.sct) for the existing surface. First, select a .mxs file for section alignment. If you need to create a .mxs file go to Input_Edit Section Alignment. Next, save the file with a new name or override a pervious file and the section file will be created. You can now use the other Section commands to draw, edit, and report from this section.

Prompts

```
Command: sctgrid2
Reading edges 1393, intersections found 541
```

Prerequisite: a surface

Keyboard Command: sctgrid2

Sections From Design Surface

This command will create a section file (.sct) for the design surface. First, select a .mxs file for section alignment. If you need to create a .mxs file go to Input_Edit Section Alignment. Next, save the file with a new name or override a pervious file and the section file will be created. You can now use the other Section commands to draw, edit, and report from this section.

Prompts

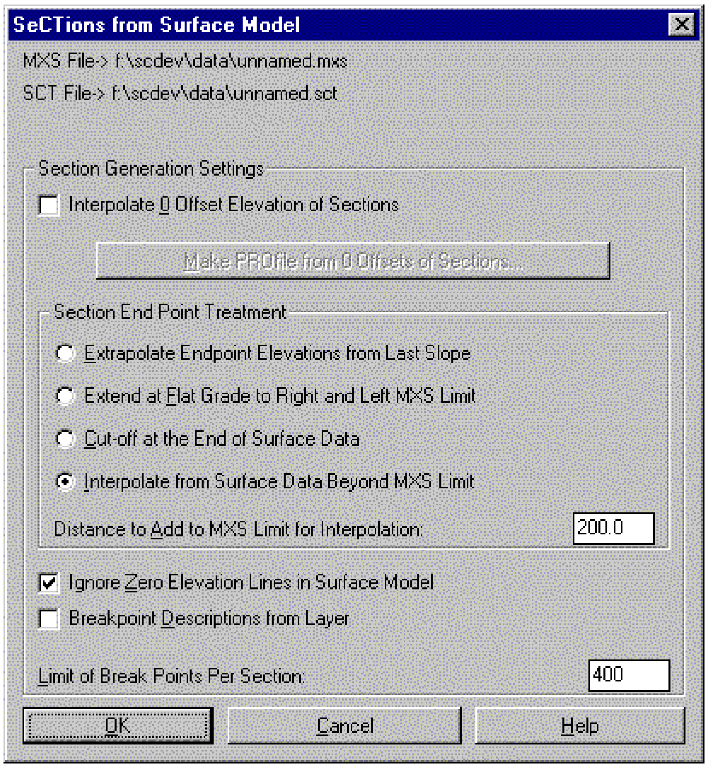
```
Command: sctgrid3
Reading edges 1393, intersections found 541
```

Prerequisite: a surface

Keyboard Command: sctgrid3

Sections from Screen Entities

This command allows you to create cross sections from a surface model. The stations for the sections and the left and right offset distances are defined in the MXS file that must be created before running this routine using Input-Edit Section Alignment. The surface model is defined by lines or polylines with elevation. The polylines with elevation could be a contour drawing file from a photogrammetry firm or can be created from survey points with the *Triangulate & Contour* command. When using Triangulate & Contour, it is useful to use the Draw Triangulation Lines option because the 3D triangulation lines represent all the break lines in the surface which increases the accuarcy of the cross section, as against just using the contours. Barrier lines or 3D polylines can also be used to represent break lines along ridges and valleys. The program samples the selected lines, polylines and 3DFace entities and calculates the intersections of these segments with any of the cross sections. The station, offset and elevation of these intersections make up the data in the section file. This section file (.SCT file extension) can be reviewed or edited with the *Input-Edit SeCTion File* command. Also the section file can be plotted with the *Draw Section File* command or used in the by the *Earthworks and Final Contours* command to calculate volumes.



SeCTions from Surface Model

MXS File-> f:\scdev\data\unnamed.mxs

SCT File-> f:\scdev\data\unnamed.sct

Section Generation Settings

☐ Interpolate 0 Offset Elevation of Sections

Section End Point Treatment

○ Extrapolate Endpoint Elevations from Last Slope

○ Extend at Flat Grade to Right and Left MXS Limit

○ Cut-off at the End of Surface Data

● Interpolate from Surface Data Beyond MXS Limit

Distance to Add to MXS Limit for Interpolation: 200.0

☑ Ignore Zero Elevation Lines in Surface Model

☐ Breakpoint Descriptions from Layer

Limit of Break Points Per Section: 400

The options for this command are set in the dialog shown below. The Interpolate 0 Offset Elevation of Sections option will add a data point at offset zero for every station with an elevation that is interpolated from existing offsets. The Breakpoint Descriptions from Layer option will store the layer name of the surface entity as the description for the offset-elevation point in the section file. The section end points are the left and right furthest offsets such as left and right 100 feet. When calculating sections based on the intersections with surface entities, there usually, intersection exactly at the end points is not possible. For example, there could be contours at offsets right 87.31 and 105.43 but no intersection exactly at 100. There are four methods for determining the elevation for these end points. (1) The Extrapolate Endpoint Elevation from Last Slope calculates the slope from the last two offset-elevation points and calculates the elevation at the endpoint from this slope. For example, given offsets at 80 with elevation 100 and 90 with elevation 101, the elevation at offset 100 would be 102. (2) Extend at Flat Grade to Right and Left MXS Limit uses the last offset elevation as the end point elevation. For example, if the last offset were 85 with elevation 102, the program would add an offset at 100 with elevation 102. (3) The Cut-off at the End of Surface Data option does not add offsets at the end points. The sections will end at the last offset found in the surface model. (4)Interpolate from Surface Data Beyond MXS Limit looks beyond the offset limit for more intersections with surface entities. Then the endpoint elevation is interpolated between the offsets above and below the endpoint.

For example, given offsets at 90 with elevation 101 and at 110 with elevation 103, the endpoint offset at 100 would have elevation 102.

Prompts

MXS File to Process Select the section alignment file

New or Append Choose whether to create a new section file or add to an existing section file

Section File to Create Specify the section file

Select Lines, PLines, and/or 3DFaces that define the surface.

Select objects: *pick the surface entities*

Compiling file c:\scdev\data\simo2.sct

Prerequisite: Construct surface model to be sampled

Sections from Grid or FLT File

This command creates a cross-section file (.SCT file) from a surface model that is defined by a 3D rectangular grid file (.GRD file) or a triangulation file (.TIN). The grid file can be created in the DTM-Contour module with the *Make 3D Grid File* routine. The triangulation file can be created with the Write Triangulation File option in the *Triangulate & Contour* command. This command also requires an .MXS file to define the alignment and stations of the sections. The number of section points created is displayed at the end of the routine.

Prompts

Choose Grid file to process

Choose MXS File to Process

Choose SCT file to write

Found 1410 section points.

Prerequisite: A grid file (.GRD file) or triangulation file (.TIN file) and a cross sections alignment file (.MXS file)

Keyboard Command: profedit

Sections from Polylines

This command allows the user to select a polyline that represents a section in cross section view and writes it to a .SCT file. This can be useful for revising sections or for defining a new one. For example, let's say you have extracted sections from a surface model of the existing ground on a site and have plotted them using the *Draw Section File* command. Now use this command to send the sections to a Section file and compute the earthworks using the *Calculate Sections Volume* command. After selecting the command, the Polyline to Section File dialog appears.

The first time this command is selected the output Section file is set to the same name as the current drawing. Select the Section File Name... button to specify a different name.

The Station Interval edit box allows you to specify the amount that the default station number will be incremented as the station prompt shown below appears.

The Interpolate Zero Offset toggle if on, causes the program to output the elevation of the zero offset to the output .SCT file.

A second section file can be specified to process two sections at a time for each station. This allows you to handle both existing and final grades at once.

After selecting the OK button the prompts below appear.

Prompts

Command:
SCTFPL
Exit/Pick text/<Station <0.0000>>: Press Enter for the default

Exit/Pick text/<Starting elevation of grid <100.0000>>: Pick Text from the screen

[int on] Pick point at starting elevation and zero offset of section ([Enter] for none): Press Enter
Select station 0.0000 section polyline: Pick a Polyline
Renamed original file> C:/TAKEOFF_2004/DEMO2A-OG.SCT as> C:/TAKEOFF_2004/DEMO2A-OG.sck
1 -1766.0303 832.1150
2 -1768.3750 805.5000
3 -1765.7500 780.0000
List continues...
Sta> 0.000 Revised data stored in C:/TAKEOFF_2004/DEMO2A-OG.SCT
Exit/Pick text/<Station <50.0000>>: Press Enter for the default

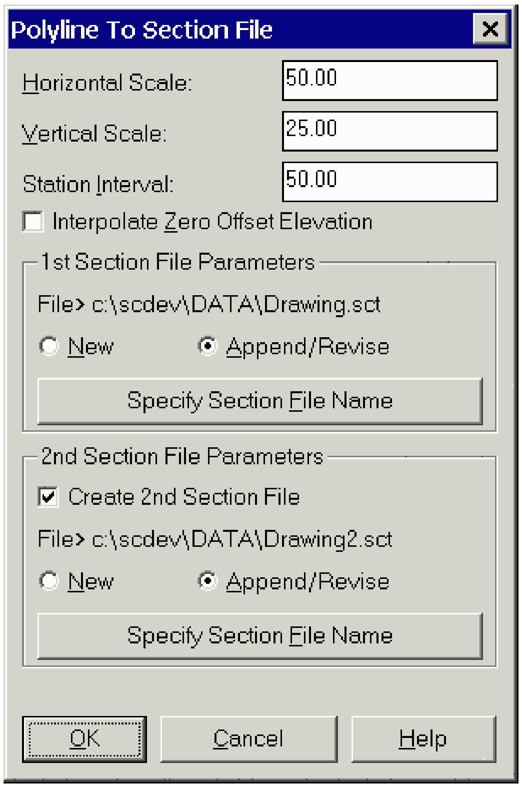
Exit/Pick text/<Starting elevation of grid <100.0000>>: Pick Text from the screen

[int on] Pick point at starting elevation and zero offset of section ([Enter] for none): Press Enter

Select station 50.0000 section polyline: Pick a Polyline

Renamed original file> C:/TAKEOFF_2004/DEMO2A-OG.SCT as> C:/TAKEOFF_2004/DEMO2A-OG.sck
1 1857475.2197 159052.3650
2 1857472.8750 159025.7500
3 1857475.5000 159000.2500
List contiunes...
Sta> 50.000 Revised data stored in C:/TAKEOFF_2004/DEMO2A-OG.SCT
Exit/Pick text/<Station <50.0000>>: Exit
Prerequisite: Plot the section or profile to write to the .SCT file.

Keyboard Command: sctfpl



Polyline To Section File

Horizontal Scale: 50.00

Vertical Scale: 25.00

Station Interval: 50.00

☐ Interpolate Zero Offset Elevation

1st Section File Parameters

File> c:\scdev\DATA\Drawing.sct

○ New ● Append/Revise

2nd Section File Parameters

☑ Create 2nd Section File

File> c:\scdev\DATA\Drawing2.sct

○ New ● Append/Revise

Sections from Points

This command creates an .SCT file from Carlson points in the drawing. An .MXS file is needed to define the centerline and the stations of the cross sections. The offsets for the cross sections points are derived from the perpendicular distance between the centerline and the TakeOff points. The cross section elevations come directly from the elevations of the points. In order to be included in a cross section, a TakeOff point must be within the offset tolerance distance of the cross section line.

Prompts

Choose MXS File to Process

Choose SCT file to write

Enter the maximum offset tolerance <1.0: *Press Enter*

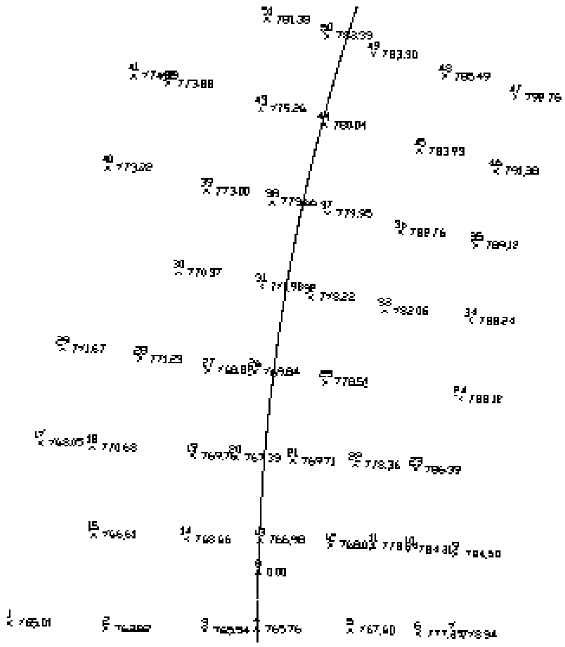
Ignore Zero Elevations (<Yes>/No)? *Press Enter*. This option will filter out all Carlson points that have a zero elevation.

Select the Carlson points along the sections.

Select objects: *pick the Carlson point inserts*

Prerequisite: Carlson points and an MXS file

Keyboard Command: sctpts



TakeOff points for use in creating Section file

Import Sections

This command converts Columnar Text, Agtek, Ceal, GeoPak, IGRDS, Moss, RoadCalc, SMI, and Softdesk files into Carlson TakeOff section (.section) files.

Prerequisite: a Columnar Text, Agtek, Ceal, GeoPak, IGRDS, Moss, RoadCalc, SMI, or Softdesk file

Sections to 3D Polylines

This command creates 3D polylines from a section (.SCT) file. Besides the section file, a centerline polyline, centerline file or section alignment (.MXS) file must be specified to define the plan view location of the 3D polylines. The elevations for the 3D polylines come from the section file. These 3D polylines can then be used by other Carlson routines to create surface models.

Typically, the 3D polylines are drawn as cross-sections perpendicular to the centerline at each station. When using a polyline centerline instead of the .MXS file, there is an option to draw by connecting similar descriptions to make 3D polylines parallel to the centerline. For example, if the section file has descriptions for each section point then you can draw 3D polylines for EP, SHD, TIE, etc.

Prompts

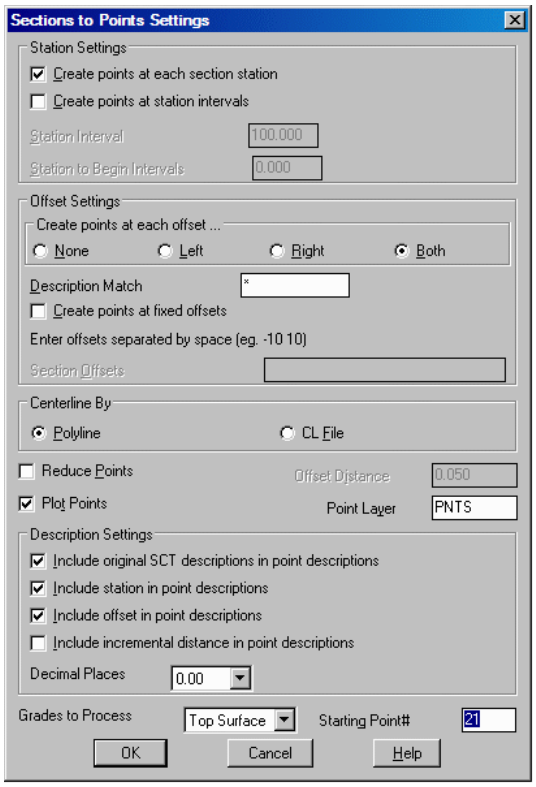
Layer Name for 3D Polylines <3DXSEC>: *press Enter*
Align sections by MXS file, centerline file or polyline [MXS/Centerline/<Polyline>]? *press Enter*
Choose Section File to Process Select the .sct file
Range of stations: 1.14 to 1605.25
Enter the starting station to process <1.14>: *press Enter*
Enter the ending station to process <1605.25>: *press Enter*
Draw sections or offset polylines by description [<Section>/Offset]? *press Enter*
Type of centerline [<ROadway>/RAilroad]? *press Enter.* This option chooses between roadway and railroad

methods for stationing along curves.
Select centerline polyline: *pick the polyline*
Enter the centerline starting station <0.0>: *press Enter*
Draw perimeter of sections [Yes/<No>]? *Y* This option will connect all the left most offsets and right most offsets together with a 3D polyline.
Use reference profile to interpolate between sections [<Yes>/No]?*N for no.* This option will prompt for a profile to use for interpolating elevations along the 3D polylines between the section stations. This improves the accuracy when the profile goes through vertical curves. Without the profile, the 3D polyline elevations will be straightline interpolated between the sections.
Draw all template ids or specific ids and offsets [All/<Specific>]? *press Enter for Specific*
Enter Offset or Description to draw: *EP*

Keyboard Command: scto3dp
Prerequisite: A section (.SCT) file

Sections to Points

This command creates Carlson points using a section (.SCT) file to define the point elevations. The x,y position of the points are calculated based on the station and offset along a centerline polyline. These points are stored in the current coordinate (.CRD) file and can also be plotted in the drawing. Points can be created at each station in the section file or at a set station interval. The range of stations to process can also be set. The Description Match field can be used to filter the offsets and only create points with matching descriptions (e.g. only "EOP" offsets). The Create points at fixed offsets option can be used to make points at user-specified offset distances. The program will interpolate the elevations for these points by interpolating from the neighboring offsets. The is both a Centerline by Polyline or by CL File option. The CL File option will prompt for an existing centerline (.CL) file. The Reduce Points option will skip creating points for the same offset between stations if the x,y position and elevation change is less than the offset tolerance. Essentially, when a series of offsets are on a straight line (no vertical and no horizontal curve) then only the starting and ending points are needed and all the intermediate points can be skipped. For example, the Reduce Points routine will look at the left side EOP offset points at stations 1+00, 1+05 and 1+10 and if these three points make a straight line then the point for station 1+05 can be reduced. The Offset Distance is the tolerance that Reduce Points using for testing whether the middle point (offset point at station 1+05) can be reduced. The distance for the middle point is calculated as the perpendicular distance from the middle point to the line between the two end points. Both the horizontal and vertical distances are checked.



Station Settings

☑ Create points at each section station

☐ Create points at station intervals

Station Interval 100.000

Station to Begin Intervals 0.000

Offset Settings

Create points at each offset ...

○ None ○ Left ○ Right ● Both

Description Match *

☐ Create points at fixed offsets

Enter offsets separated by space (eg. -10 10)

Section Offsets

Centerline By

● Polyline ○ CL File

☐ Reduce Points Offset Distance 0.050

☑ Plot Points Point Layer PNTS

Description Settings

☑ Include original SCT descriptions in point descriptions

☑ Include station in point descriptions

☑ Include offset in point descriptions

☐ Include incremental distance in point descriptions

Decimal Places 0.00

Grades to Process Top Surface Starting Point# 21

Prompts

Sections to Points Settings dialog
Coordinate File to Process Choose a .CRD or other coordinate file to add the points to. This prompt only occurs if no coordinate file is current.
Choose SCT file to read *pick the cross section file*
Range of stations: 3.34 to 750.00
Enter the starting station to process <3.34>: *press Enter*
Enter the ending station to process <750.00>: *press Enter*
Select centerline polyline: *pick the polyline that defines the stations*
Type of centerline [<ROadway>/RAilroad]? *RO*
Enter the centerline starting station <0.0>: *press Enter*
Created 65 points.

Keyboard Command: sctopt
Prerequisite: A .sct file and polyline centerline

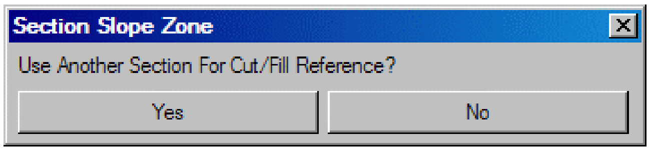
Slope Zone Section Analysis

This command reports the cut/fill areas and volumes within given ranges of slopes. There is an option to use another section for cut/fill reference.

Prompts

Select Section to Process ***Select .SCT file***
Select Slope Zone dialog
Report slope or horizontal area [<Horizontal>/Slope]? *S*
Slope format [<Percent>/Ratio]? *press Enter*
Greatest slope % of zone 1: *3*

Greatest slope % of zone 2: *press Enter*
Starting station to process <0.000>: *press Enter*
Ending station to process <0.000>: *1000*
The Standard Report Viewer creates a report called Section Slope Zone Analysis Report.



Keyboard Command: sctzone
Prerequisite: .SCT file

Highway Section Staging

This command takes a design cross section and splits it into two stages for cases when the design surface will be built in stages. There are two staging methods.

The Offset method splits the design section at a specified offset with the left side as one stage and the right side as the other stage. This method applies to the situation of designing a partly completed road or regrade. For example, if a four lane road will built two lanes at a time, then the offset method can be used to split the design section with two lanes on the left side of the offset and the other two lanes on the right side. Using an existing and a final grade section file, the program will create four new sections files for the finished existing sections, finished final sections, remaining existing sections, and remaining final sections. The source existing and final section files should have matching stations. There is an option to process a range of the possible stations from the section files. The complete part of the road can be either on the left or right side. The pivot point is a cross section offset where the completed part ends. From this point, the final grade will connect to the existing grade by a line at the specified slope.

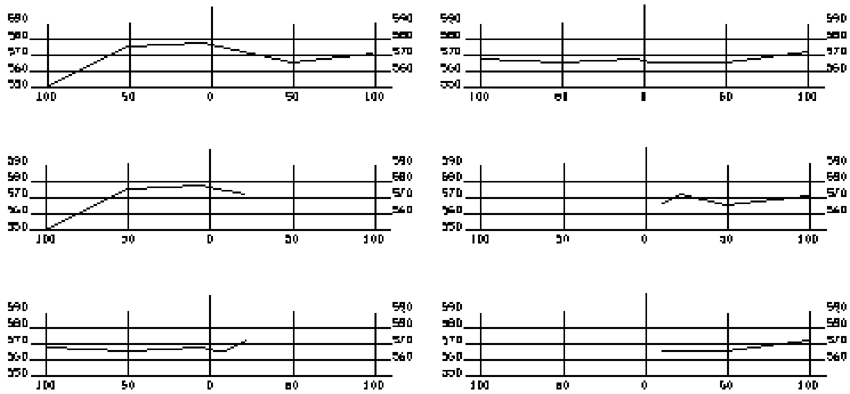
The Description method uses a specified description from the existing ground section file plus an offset from this description. Then the existing section is overlaid onto the design section for the offset zone around this description. This method applies when a portion of the existing ground stays intact when the first stage of design is built and then this remaining portion of the design is done as the second stage. For example, this applies to improving railroads where the existing track is left undisturbed while the work for the new bed is prepared. In this case, the existing section file should have a description for the offset position of the existing track centerline. Then you specify the buffer offset around this centerline. From the resulting left and right offsets, the program ties the existing section into the design at a specified slope.

Prompts

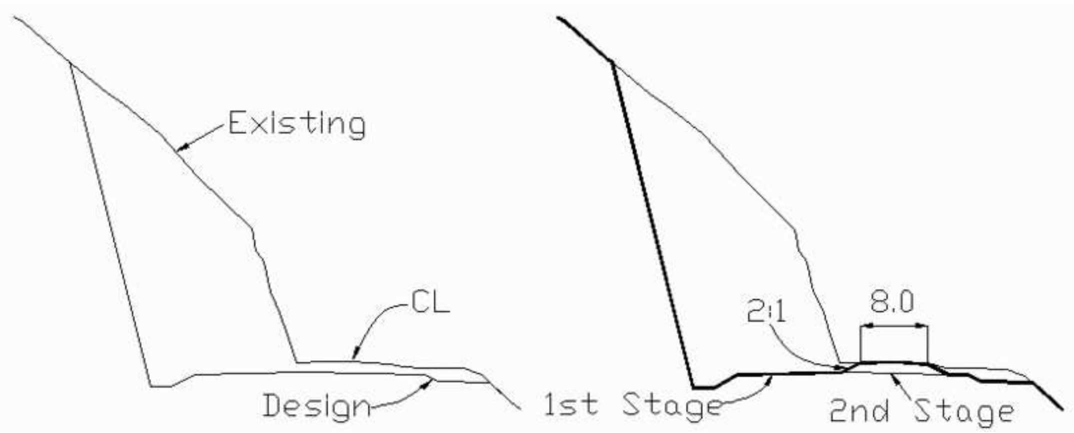
For Offset Method:
Select Existing Sections File Choose the cross sections file.
Select Final Sections File Choose the cross sections file.
Enter slope as percent grade or slope ratio [Percent/<Ratio>]? *press Enter*
Enter the fill slope ratio <2.0>: *press Enter*
Enter the cut slope ratio <2.0>: *press Enter*
Stage by side from offset or overlay existing at description [<Offset>/Desc]? *press Enter*
Place road on left or right [<Left>/Right]? *press Enter*
Range of stations: 50.0 to 100.0
Enter the starting station to process <50.0>: *press Enter*
Enter the ending station to process <100.0>: *press Enter*
Apply same pivot offset to all stations [Yes/<No>]? *Y*
Enter the pivot offset (enter left offsets as negative) <0.0>: *5.0*

SCT File dialogs Enter new .SCT file names for 1) existing road .SCT file, 2) final road .SCT file, 3) remaining existing .SCT file and 4) remaining final .SCT file.

Here is an example of the Offset method showing the original existing and design sections and then the four new sections files for the finished existing sections, finished final sections, remaining existing sections, and remaining final sections that the routine creates.



For Description Method:
Enter slopes as percent grade or slope ratio [Percent/<Ratio>]? *press Enter*
Enter the fill slope ratio <2.0>: *press Enter*
Enter the cut slope ratio <2.0>: *press Enter*
Stage by side from offset or overlay existing at description [<Offset>/Desc]? *D for description*
Existing section target description: *CL*
Range of stations: 100.00 to 100.00
Enter the starting station to process <100.00>: *press Enter*
Enter the ending station to process <100.00>: *press Enter*
Enter the buffer offset <0.0>: *4*
Here is an example of the before and after for the Description method.



Pulldown Menu Location: Sections
Keyboard Command: sctstage
Prerequisite: Existing and final grade section files (.SCT)

Input-Edit Section File

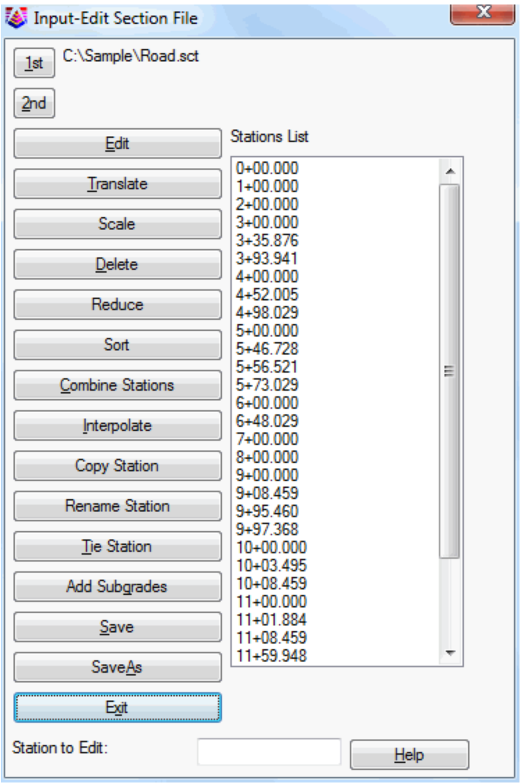
This program can be used to enter or edit data stored in a section file (.SCT file), including a real-time graphic window in the Edit mode. The section data consists of stations, offsets, elevations and descriptions. This command also has utilities for translating the offsets and elevations, deleting stations from the file, intersecting the outslopes of one section file with another, combining multiple occurrences of the same station and sorting the stations, offsets and elevations.

While editing the section file, a second section file can be used as reference. To choose this file, pick the 2nd button. For example, when editing the proposed section file, you can reference and view the ground section file as the second file. Besides showing the reference section in the graphic preview, the program also reports the end areas while editing a section station. Also, the reference section can be used to tie to the catch point.

The program begins by prompting for a New or Existing section .SCT file to process. The Section file to process dialog appears, allowing you to specify the file that you want to operate on. Use the New option to create a new file. Use the Existing option to edit the offsets and elevations for station/sections that you have already created, or append new stations to a file. The program defaults to a section file with the same name as the drawing or a name that you specified using another section command. You also can choose a 2nd existing .SCT file to reference. After specifying the file name(s), the program displays any stations currently in the file, in the Stations List of the Input-Edit Section File dialog box.

Alternately, when sections are drawn in the drawing, you can double-click on a section polyline to launch Input-Edit Section File for the .SCT file associated with the section polyline.

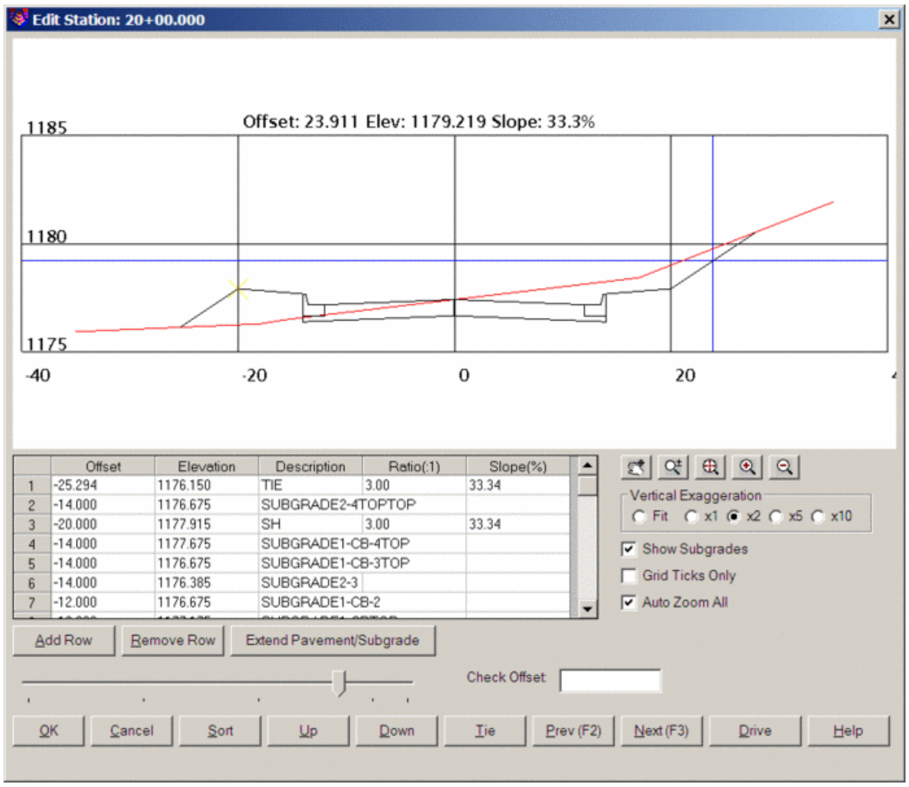
If you specified a new file, the Stations List box will be blank. To edit and display the offset and elevation data at a station, you can double click on the station in the Stations List box, or input the station in the Station to Edit edit box at the bottom of the dialog. To add a station to a new file or existing file, you must enter the station in the Station to Edit edit box. Stations will present in accordance with the Section-Profile settings in Configure under the Settings pulldown menu (eg. 10+00, 1+000, 1000).



C:\Sample\Road.sct

0+00.000
1+00.000
2+00.000
3+00.000
3+35.876
3+93.941
4+00.000
4+52.005
4+98.029
5+00.000
5+46.728
5+56.521
5+73.029
6+00.000
6+48.029
7+00.000
8+00.000
9+00.000
9+08.459
9+95.460
9+97.368
10+00.000
10+03.495
10+08.459
11+00.000
11+01.884
11+08.459
11+59.948

Edit: Opens the Edit Station dialog which shows a graphic of the section on top, a list of the offset-elevation points in the middle, and the function buttons on the bottom. To add an offset point, type in the offset, elevation and optional description in the spreadsheet. Left offsets are entered as negative numbers. You can enter the slope or ratio from the last point and the program will calculate the elevation. To edit an offset point, highlight the point from the list and then edit the values in the Offset, Elev and Desc columns. The highlighted point will be marked by an X in the graphic screen. The Sort button will sort the list of offsets from lowest to highest, left to right. It is recommended that you Sort offsets before doing the Tie command, so that the left-most and right-most offsets appear first and last in the offset list. The Up button will move the highlighted offset point up in the list. Likewise the Down button moves the highlighted offset point down in the list. Prev (F2) and Next (F3) buttons move through the stations and allow you to review and edit stations in forward or reverse order. The scroll bar can also be used to quickly move through stations and then zero in with Prev (F2) or Next (F3).



Offset: 23.911 Elev: 1179.219 Slope: 33.3%

	Offset	Elevation	Description	Ratio(:1)	Slope(%)
1	-25.294	1176.150	TIE	3.00	33.34
2	-14.000	1176.675	SUBGRADE2-4TOPTOP		
3	-20.000	1177.915	SH	3.00	33.34
4	-14.000	1177.675	SUBGRADE1-CB-4TOP		
5	-14.000	1176.675	SUBGRADE1-CB-3TOP		
6	-14.000	1176.385	SUBGRADE2-3		
7	-12.000	1176.675	SUBGRADE1-CB-2		

Vertical Exaggeration ○ Fit ○ x1 ● x2 ○ x5 ○ x10

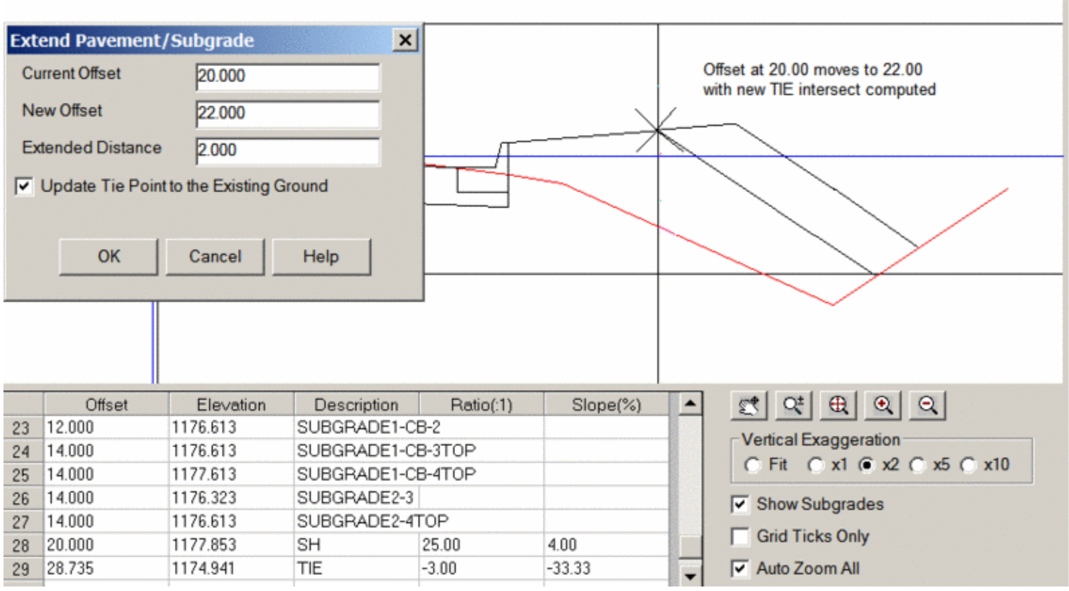
☑ Show Subgrades

☐ Grid Ticks Only

☑ Auto Zoom All

Check Offset

The Add Row button inserts an offset line above the currently highlighted row. The Remove Row button erases the highlighted offset and elevation from the list. After inputting or editing press the OK button to return to the Stations List dialog and keep any changes you have made. Select the Cancel button if you want to cancel changes made to the current station. Extend Pavement/Subgrade will allow you move a surface point and shift, in parallel, the associated subgrades and tie points. One application, shown below, is to extend a shoulder point and re-computer the TIE point, all in one clean operation:



Current Offset 20.000

New Offset 22.000

Extended Distance 2.000

☑ Update Tie Point to the Existing Ground

Offset at 20.00 moves to 22.00 with new TIE intersect computed

	Offset	Elevation	Description	Ratio(:1)	Slope(%)
23	12.000	1176.613	SUBGRADE1-CB-2		
24	14.000	1176.613	SUBGRADE1-CB-3TOP		
25	14.000	1177.613	SUBGRADE1-CB-4TOP		
26	14.000	1176.323	SUBGRADE2-3		
27	14.000	1176.613	SUBGRADE2-4TOP		
28	20.000	1177.853	SH	25.00	4.00
29	28.735	1174.941	TIE	-3.00	-33.33

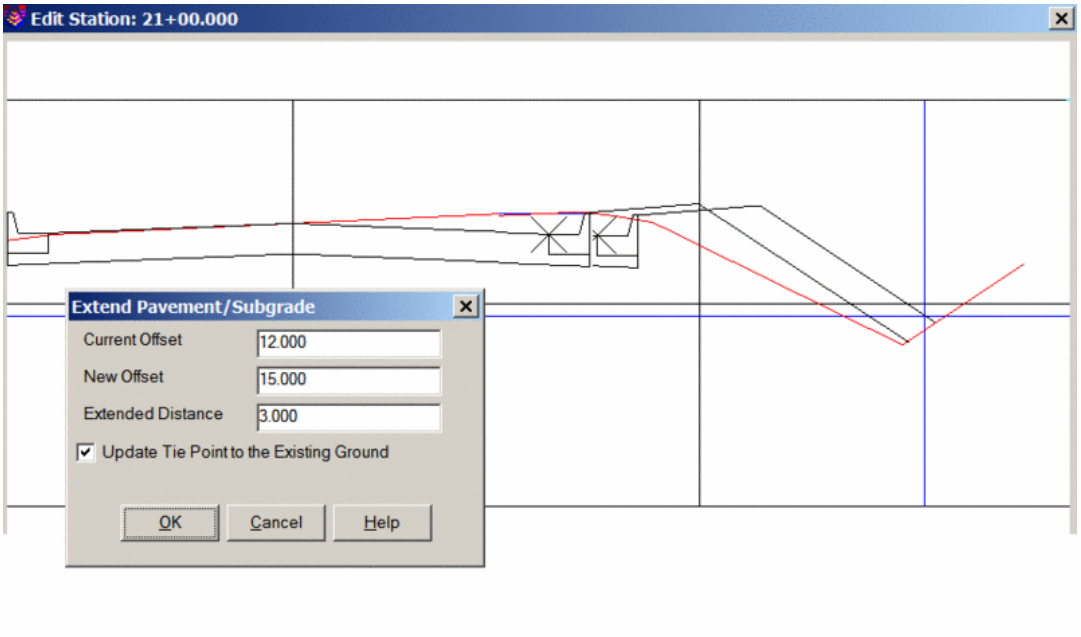
Vertical Exaggeration ○ Fit ○ x1 ● x2 ○ x5 ○ x10

☑ Show Subgrades

☐ Grid Ticks Only

☑ Auto Zoom All

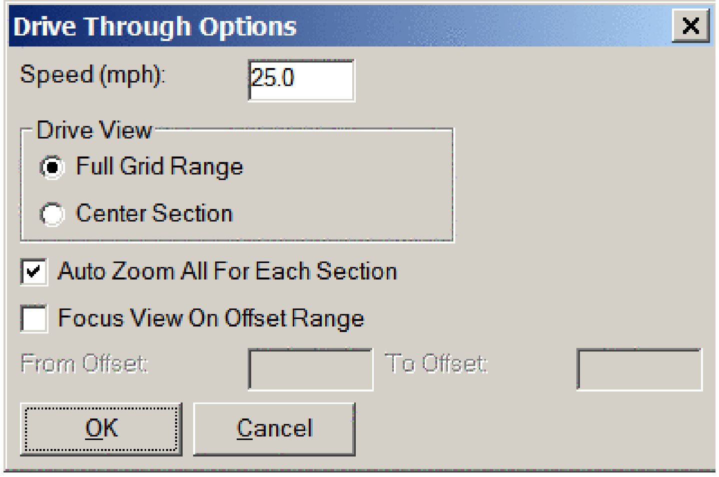
Another application of Extend Pavement/Subgrade is to move the curb position and all associated subgrades. The "inside" curb point is at 12.00 units from centerline. If the pavement is extended from 12 to 15 at this station, use of this feature will extend the subgrades, maintain all slopes and re-compute the TIE point, as shown below:



Current Offset 12.000
New Offset 15.000
Extended Distance 3.000
☑ Update Tie Point to the Existing Ground

A real-time report of offset-elevation-slope now displays in the top of the graphic as you move the cursor across the section in the graphic window. The screen defaults to zoom mode where holding down the right-mouse button zooms in and out. You can also switch to pan mode. There are buttons for zoom extents, zoom in and zoom out. If your mouse has a scroll button, you can hold it down to pan and scroll it to zoom in and out. You can also set the Vertical Exaggeration ranging from 1X to 10X and including "Fit". Show subgrades has the ability to tie a subgrade into the surface. Grid Ticks Only just shows the left and bottom axis lines of the grid with grid tick marks along the axes. With Auto Zoom All turned off, you can hold the same view position as you click Next and Previous and move through the list of stations. The Check Offset field calculates an elevation based on an entered offset.

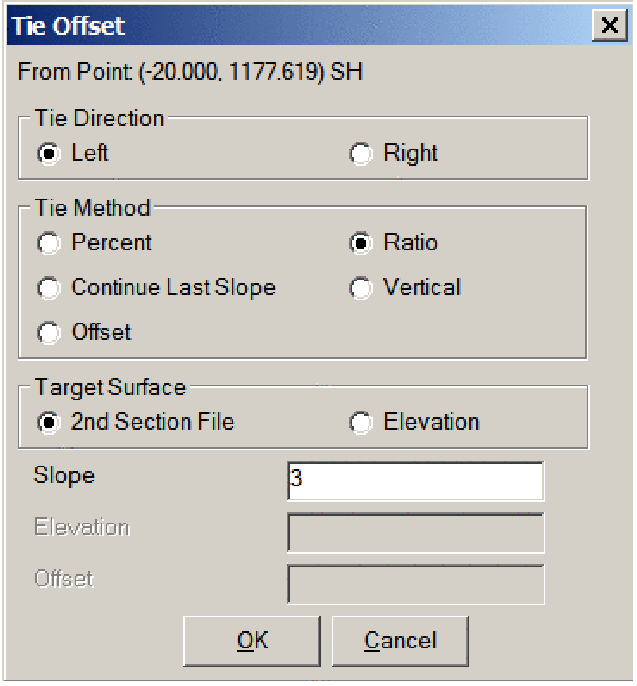
Drive (Edit Station): This function scrolls through the sections at the rate of speed specified by the user in the Speed window. The Drive View options determine whether the sections are displayed using the full width of the graphic window or centered in the window. The combination of Full Grid Range and Auto Zoom All allows the sections to rise and fall with the centerline elevations, as if you were driving an actual road. With Auto Zoom All off, and Full Grid Range on, the grid itself moves up and down at the current position of the first section, as you drive. Focus View On Offset Range allows the user to set the left and right viewing limits of the sections. Section data beyond the specified limits is not displayed.



Speed (mph): 25.0
Drive View
● Full Grid Range
○ Center Section
☑ Auto Zoom All For Each Section
☐ Focus View On Offset Range
From Offset:
To Offset:

Elevation Field (Edit Station): Equations (+, -, ∗, /) can be entered to calculate or adjust an elevation. For instance, to subtract 1.25' from elevation 1926.18, simply enter 1926.18-1.25 and press enter. The new elevation will be calculated and displayed in the viewer window.

Tie (Edit Station): The Tie button allows you to tie the left and right surface points of the 1st section file into the 2nd section file. It is used for classic outslope intersects from final grade to existing grade. The dialog layout includes an option to tie the section to a specified elevation, in addition to a surface (second section file). A left or right tie direction can also be selected. If a point has been tied in from SH for shoulder at offset -20 at 3:1, a new offset with the description "TIE" is created. If you try another outslope such as 4:1 from the same SH shoulder point, a new "TIE" point is created and the old TIE point is removed automatically.



Tie Offset

From Point: (-20.000, 1177.619) SH

Tie Direction
● Left ○ Right

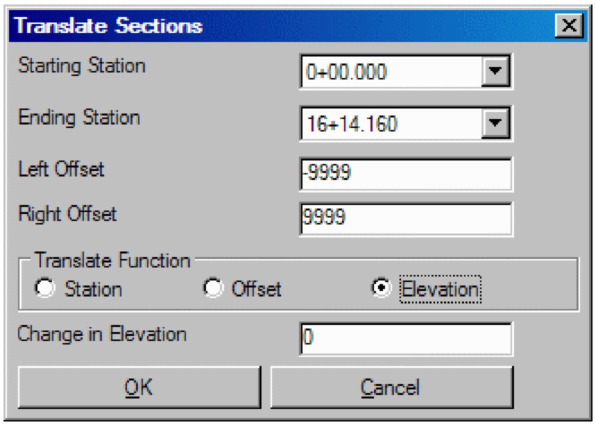
Tie Method
○ Percent ● Ratio
○ Continue Last Slope ○ Vertical
○ Offset

Target Surface
● 2nd Section File ○ Elevation

Slope: 3
Elevation:
Offset:

Lock: This function will tag the section file as locked so that no routine can automatically overwrite this file. If a routine attempts to overwrite this section file, the program will stop, report that the file is locked and prompt whether to override the lock.

Translate: Allows you to add or subtract a distance from the offsets to adjust or shift the centerline. You can also adjust the elevations up or down. When using this option, you can choose the range of stations to operate on (starting and ending stations) and the values to adjust the offsets and elevations. If, for example, you want to shift the centerline, but not the elevations, enter the plus or minus amount you want to translate, and when prompted for the elevation enter zero.



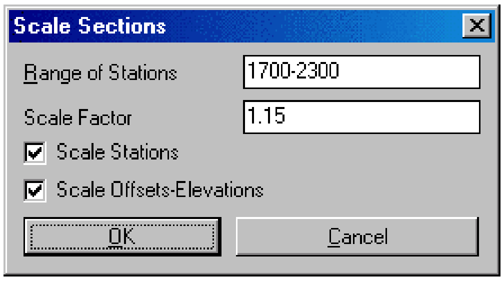
Translate Sections

Starting Station: 0+00.000
Ending Station: 16+14.160
Left Offset: -9999
Right Offset: 9999

Translate Function
○ Station ○ Offset ● Elevation

Change in Elevation: 0

Scale: Allows you to scale the station, offsets and/or elevations by the specified scale factor. This function can be used to convert between English and metric units.


Scale Sections

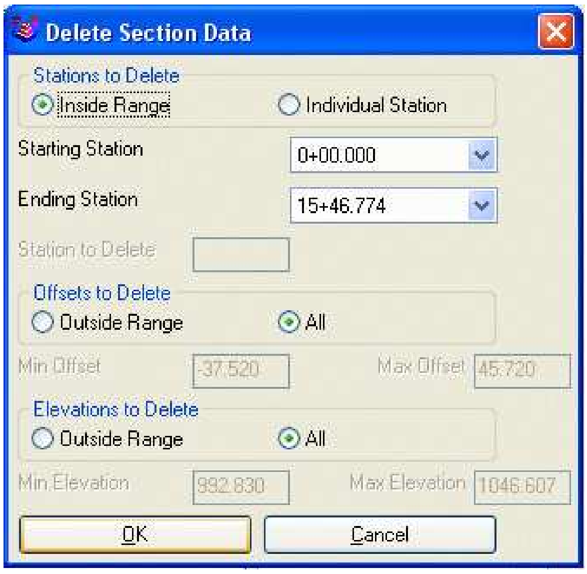
Range of Stations 1700-2300

Scale Factor 1.15

☑ Scale Stations

☑ Scale Offsets-Elevations

Delete: Allows you to remove a station or range of stations from the Stations List. You can delete a range of stations or an individual station. Also there are options to delete all the data for the selected stations or filter to delete only data that is outside an offset or elevation range. Since the station editor data is stored in memory, if you accidentally delete a range, Quit the editor without saving the stations to disk. Then recall the original file.


Delete Section Data

Stations to Delete

● Inside Range ○ Individual Station

Starting Station 0+00.000

Ending Station 15+46.774

Station to Delete

Offsets to Delete

○ Outside Range ● All

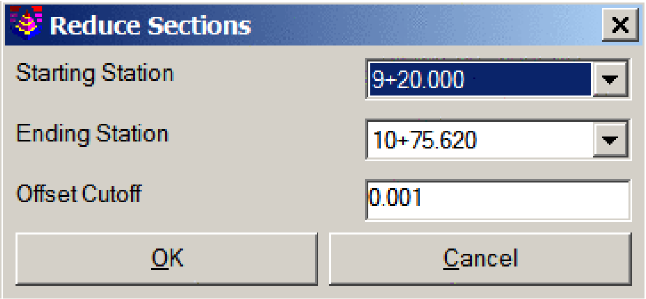
Min Offset -37.520 Max Offset 45.720

Elevations to Delete

○ Outside Range ● All

Min Elevation 992.830 Max Elevation 1046.607

Reduce: Allows you to remove offsets from a range of stations by removing vertices in the offsets that are virtually in a straight line. Using an offset cutoff, meaning no offset and elevation moves more than the entered amount (eg. 0.01), excessive numbers of vertices can be eliminated. The command is similar to Reduce Vertices when applied to the plan view.

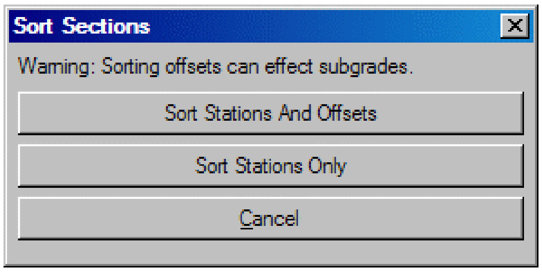

Reduce Sections

Starting Station 9+20.000

Ending Station 10+75.620

Offset Cutoff 0.001

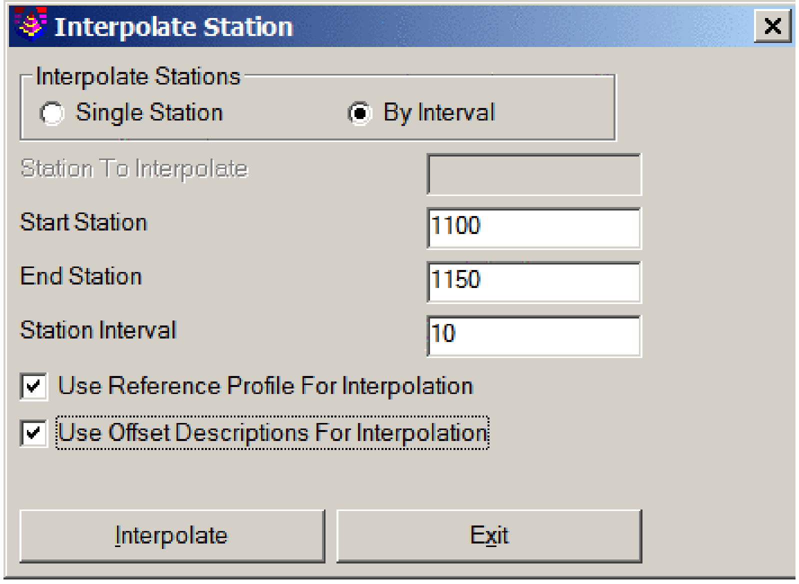
Sort: Allows you to sort the station numbers into ascending order, and sort the offsets and elevations in the individual station records (offsets are sorted from left to right). When sections are derived from the *Sections from Surface Entities* command they are already sorted, but when sections are digitized or input manually they occur in the order that you digitized them. So, for proper plotting and earthworks, you may want to run the Sort option before processing.


Sort Sections

Warning: Sorting offsets can effect subgrades.

Combine Stations: Used to bring together in one record slot multiple occurrences of the same station number. This can occur when using the Digitize Sections (XSec) command and the section that you are digitizing has match/break lines which forces you to digitize the station in two or more parts.

Interpolate: Allows you to add or overwrite a station between two stations or projecting forward from two stations. You can choose to interpolate a single station or an interval of stations. Specify the two known stations in the Start Station and End Station edit boxes, as well as the interval if using the interval method. The program will do straight line, mathematical interpolations, adding offsets to the interpolated stations to match the totality of offsets in the starting and ending stations. However, if the offsets have descriptions, you can choose to interpolate by description and the program will interpolate by description (eg. EP at 12 on Station 1100 and EP at 15 at station 1150 would lead to EP at 12.6 at 1110). There is also an option to reference a profile, so if station 1100 and 1150 were on either side of a high point at 1125, the interpolated offsets would respect the profile as well as the starting and ending station. Use of this command is often critical to creating accurate digital terrain models of sites for machine control. Select the OK button to execute the function with the current settings or select the Cancel button to abort the process.


Interpolate Station

Interpolate Stations
○ Single Station ● By Interval

Station To Interpolate

Start Station 1100

End Station 1150

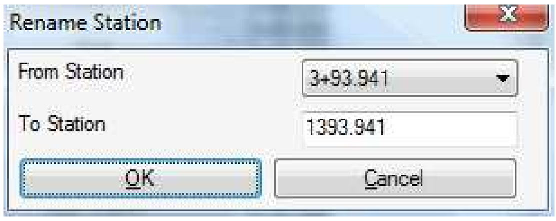
Station Interval 10

☑ Use Reference Profile For Interpolation

☑ Use Offset Descriptions For Interpolation

Copy Station: Allows you to copy a station that already exists to a new or existing station number. Choose the existing From Station using the edit pulldown box, then enter the new station number in the To Station edit box. Select the OK button to execute the function with the current settings, or select the Cancel button to abort the process.

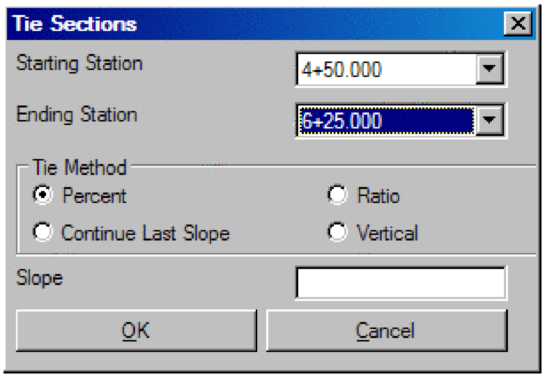
Rename Station: Allows you to change the value of a station. In the dialog, select the existing station from the list and enter in the new station value.


Rename Station

From Station 3+93.941

To Station 1393.941

Tie Station: Allows you to tie the outslopes into the reference second section file. This routine first brings up a dialog to specify the range of stations to process. It includes a line to set the slope to tie with. The program will start from the left most offset and use this slope to find the intersection with the reference section file. Then the intersection from the right most offset is calculated with this slope. These intersection points are the tie points. The slope can be defined by percent, ratio, continue the last slope, and vertical.


Tie Sections

Starting Station: 4+50.000

Ending Station: 6+25.000

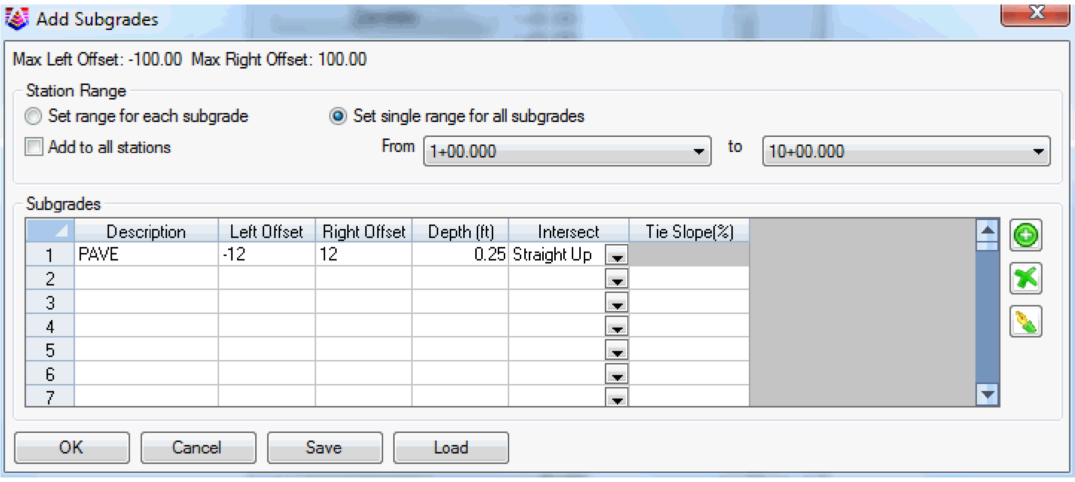
Tie Method

● Percent ○ Ratio

○ Continue Last Slope ○ Vertical

Slope:

Add Subgrades: Adds subgrades to the sections with specified depths and offsets. You can add multiple subgrades at a time by filling in the spreadsheet. Each row of the spreadsheet is for a separate subgrade. Each subgrade definition takes a description, left and right offsets, depth and intersection method of either straight up or at a specified slope. The subgrades are added by referencing the existing surface elevation and dropping down the specified depth. The center of the subgrade always drops down vertically. The outside of the subgrade ties in by the specified intersection method. The station range to add the subgrades can be the same of all the subgrades or specified separately for each subgrade.


Add Subgrades

Max Left Offset: -100.00 Max Right Offset: 100.00

Station Range

○ Set range for each subgrade ● Set single range for all subgrades

☐ Add to all stations

From 1+00.000 to 10+00.000

Subgrades

	Description	Left Offset	Right Offset	Depth (ft)	Intersect	Tie Slope(%)
1	PAVE	-12	12	0.25	Straight Up	
2						
3						
4						
5						
6						
7						

Save: Saves the currently loaded section file.
SaveAs: Allows you to save the currently loaded section file as a different file.
Exit: Allows you to exit from the section editor and return to the drawing editor. The program will warn you to save to a file if you have made changes.

Pulldown Menu Location: Sections
Keyboard Command: scted
Prerequisite: None

Draw Section File

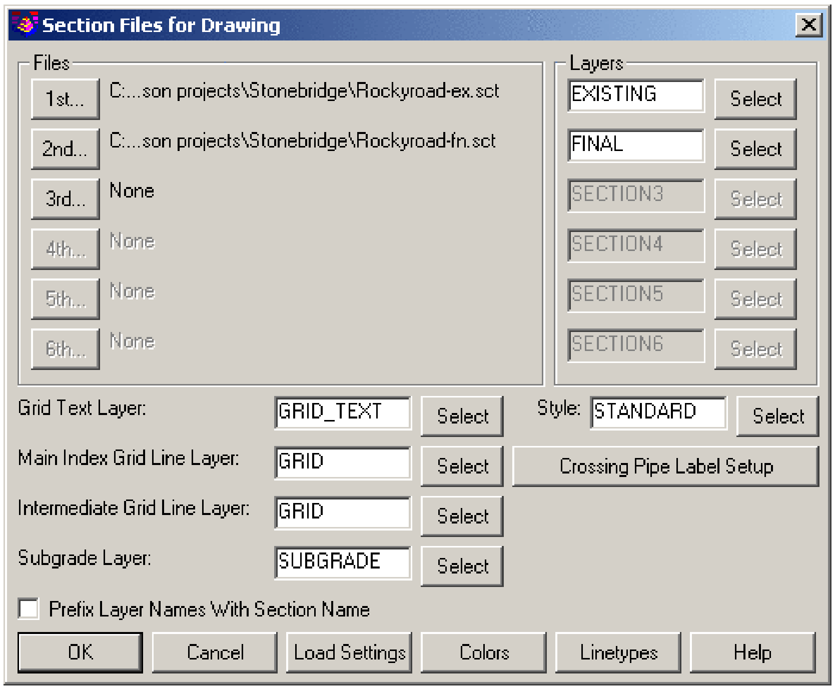
This command generates plots of cross-section data which can be used to further iterate the corridor design or used for construction documentation. The Section files drawn with this command can be created by several methods including the Input-Edit Section File, Digitize Sections, any commands under the Create Sections from... menu, Process Road Design or Road Network commands.

For metric-based projects, please refer to the Drawing Metric Section Sheets section of this document.

The Draw Section File routine will call two primary dialog boxes:

- The first is the Section Files for Drawing dialog box that allows you to specify the Section files (.sct) to be drawn and some general sheet and layer settings.
- The second is the Draw Section File dialog box that allows you to specify various scale, layout and labeling settings.

If the *Type of Plot* option in the Draw Section File dialog box is set to "Sheet," a third Section File Sheet Drafting Parameters dialog will be displayed which provides detailed sheet layout settings.



1st... C:...son projects\Stonebridge\Rockyroad-ex.sct — EXISTING
2nd... C:...son projects\Stonebridge\Rockyroad-fn.sct — FINAL
3rd... None — SECTION3
4th... None — SECTION4
5th... None — SECTION5
6th... None — SECTION6

Grid Text Layer: GRID_TEXT
Style: STANDARD
Main Index Grid Line Layer: GRID
Intermediate Grid Line Layer: GRID
Subgrade Layer: SUBGRADE
☐ Prefix Layer Names With Section Name

Files: Specify up to six Section (.sct) files to plot and Select a layer for each. To remove a section file entry from the dialog box, click the appropriate *1st*, *2nd*, *3rd*, *etc,* button which displays the standard File Selector dialog box. Without selecting a file, click the *Cancel* button from the File Selector dialog box to remove the previously specified file.

Layers: Key-in a desired layer name for each section file or click the **Select** button to specify a previously established layer.

Key-in a desired layer name or click the **Select** button to specify a previously established layer for each of the cross-section sheet items:

- **Grid Text**
- **Main Index Grid Lines**
- **Intermediate Grid Lines**
- **Subgrade**

Prefix Layer Names with Section Name: Enable this option if the layer for each section name is to be prefixed with the Section file name.

Style: Key-in a desired text style or click the Select button to specify a previously established text style that will be assign to all labels.

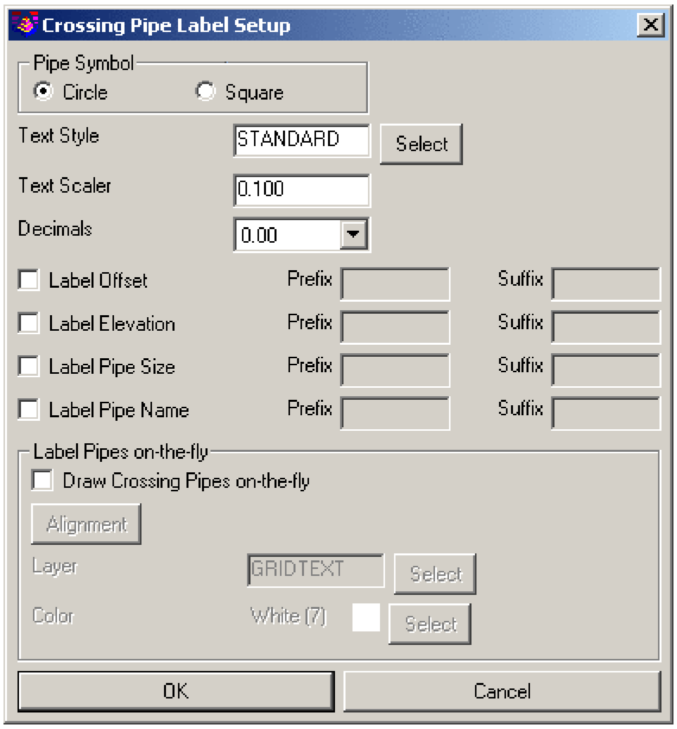
Crossing Pipe Label Setup: This button opens the Crossing Pipe Label Setup dialog box that allows you to establish settings for drawing and labeling pipes that run along or intersect the cross section alignment.

Load Settings: This option allows you to load the content of a previously saved Section Settings (.sst) file.

Colors: This option allows you assign colors to each of the aforementioned items. The recommended color for each item is *ByLayer*.

Linetypes: This option allows you assign linetypes to each of the aforementioned items and line widths to each of the section files. The recommended linetype for each item is *ByLayer*.

Crossing Pipe Label Setup



Pipe Symbol
● Circle ○ Square

Text Style: STANDARD

Text Scaler: 0.100

Decimals: 0.00

☐ Label Offset Prefix Suffix

☐ Label Elevation Prefix Suffix

☐ Label Pipe Size Prefix Suffix

☐ Label Pipe Name Prefix Suffix

Label Pipes on-the-fly

☐ Draw Crossing Pipes on-the-fly

Layer: GRIDTEXT

Color: White (7)

Pipe Symbol: Choose whether to show the Pipe Crossing symbol as a circle or a square.

Text Style, Text Scaler and Decimals: Specify the text style, size and precision of Pipe Crossing labels.

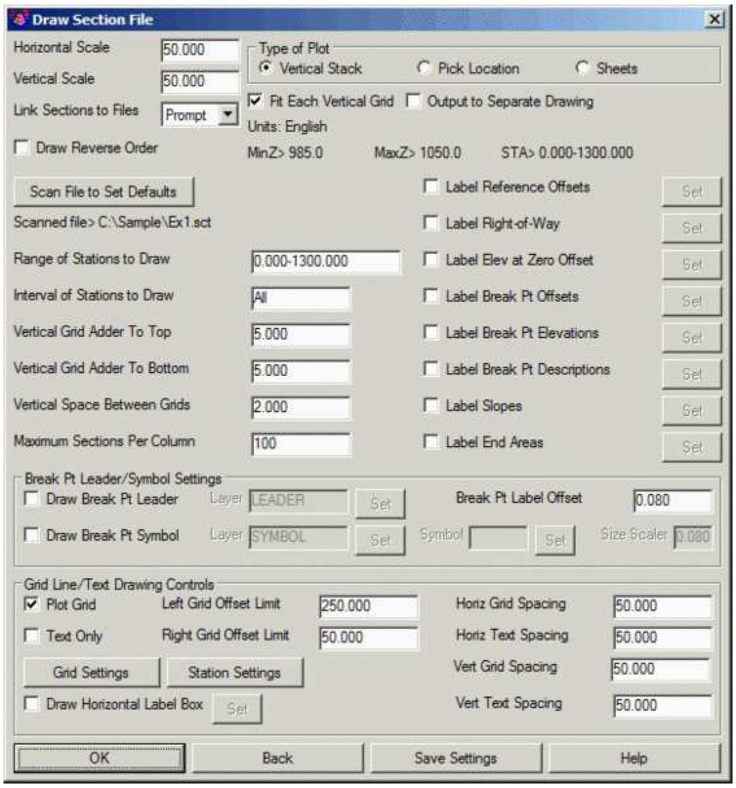
Label Offset, Label Elevation, Label Pipe Size, Label Pipe Name: Enable any or all of these options to label the distance left or right off the alignment (Label Offset), the invert elevation, pipe size and pipe name of each crossing pipe. Use the optional settings for specifying "Prefix" or "Suffix" text for each label.

Draw Pipe Crossings on-the-fly: Enable this option to have Crossing Pipes that have been created using a Sewer Network file (.sew) or Draw Pipe 3D Polyline command drawn in cross sections. It is not necessary to enable this option if Pipe Crossings have been saved to a Section file (.sct) using the Section Points from Pipes command.

Alignment: Pick this button to select either a Centerline file (.cl) or Section Alignment file (.mxs) to scan for Crossing Pipes.

Layer and Color: These settings specify the layer and color of the Pipe Crossing symbol.

After specifying the Section Files (.sct) to be drawn and applying settings for each, the Draw Section File dialog box opens:



Horizontal Scale 50.000
Vertical Scale 50.000
Link Sections to Files Prompt
☐ Draw Reverse Order
Type of Plot: ● Vertical Stack ○ Pick Location ○ Sheets
☑ Fit Each Vertical Grid ☐ Output to Separate Drawing
Units: English
MinZ> 985.0 MaxZ> 1050.0 STA> 0.000-1300.000
Scanned file> C:\Sample\Ex1.sct
Range of Stations to Draw 0.000-1300.000
Interval of Stations to Draw All
Vertical Grid Adder To Top 5.000
Vertical Grid Adder To Bottom 5.000
Vertical Space Between Grids 2.000
Maximum Sections Per Column 100
☐ Label Reference Offsets
☐ Label Right-of-Way
☐ Label Elev at Zero Offset
☐ Label Break Pt Offsets
☐ Label Break Pt Elevations
☐ Label Break Pt Descriptions
☐ Label Slopes
☐ Label End Areas

Break Pt Leader/Symbol Settings
☐ Draw Break Pt Leader Layer LEADER
☐ Draw Break Pt Symbol Layer SYMBOL
Break Pt Label Offset 0.080
Symbol
Size Scaler 0.080

Grid Line/Text Drawing Controls
☑ Plot Grid
☐ Text Only
☐ Draw Horizontal Label Box
Left Grid Offset Limit 250.000
Right Grid Offset Limit 50.000
Horiz Grid Spacing 50.000
Horiz Text Spacing 50.000
Vert Grid Spacing 50.000
Vert Text Spacing 50.000

Horizontal Scale: Specify the horizontal scale.

Vertical Scale: Specify the vertical scale. The vertical scale relative to the horizontal scale determines the vertical exaggeration factor.

Link Sections to Files: This setting controls the linkage of the plotted sections to the actual section (.sct) file(s), determining how changes to the file affect the plotted sections.

- **Off:** A linkage between the SCT file and the graphical section entities is not formed; you will need to manually re-create section sheets after section design changes.
- **Prompt:** You will be asked whether or not to update the plotted sections when the underlying SCT file is changed.
- **Auto:** The plotted sections will automatically update when the underlying SCT file changes.

Type of Plot: Specify how the sections will be plotted:

- **Vertical Stack -** will place the sections into a column up to the value of Maximum Sections per Column before beginning a new column.
- **Pick Location -** provides information about the section at each station and prompts you to precisely place each section to a location of your choosing.
- **Sheets -** will plot the sections on a block section sheet suitable for plotting.

Fit Each Vertical Grid: When checked, the grid bottom elevation and grid height are set automatically and you may specify values to add to the top and bottom of each grid (see Vertical Grid Adder to Top and Vertical Grid Adder to Bottom). When not checked, you specify the elevation of the grid bottom and the grid height through the Grid Bottom Elevation and Grid Vertical Height controls, respectively.

Output to Separate Drawing: When checked, this option will prompt for a New drawing name and location into which all cross sections will be drawn.

Draw Reverse Order: When checked, this option will draw the cross sections in the order of the highest numbered station to the lowest.

Scan File to Set Defaults: This button allows the program to set the minimum and maximum parameters. If you choose this option, the program will automatically set the range of stations, vertical spacing distance, right and left grid distances and starting/datum elevation. This option writes a file called "sectsort.tmp" that is read and used to set the defaults the next time you use the program. Therefore, if you are selecting a different .SCT file to plot you should use this option to update the .TMP file.

Range of Stations to Draw: Specify the range of stations from the file which will be drawn.

Interval of Stations to Draw: Specify the interval of stations to draw. For example, perhaps you sampled every 25 feet with the Sections from Surface Model command for more accurate quantities but only want to plot 50 foot stations. ALL is the default value for this field.

Vertical Grid Adder to Top: Specify the distance that will be added to the highest elevation of the section for the sheets and pick location options. This option is only available when Fit Each Vertical Grid is checked ON.

Vertical Grid Adder to Bottom: Specify the distance that will be subtracted from the lowest elevation of the section for the sheets and pick location options. This option is only available when Fit Each Vertical Grid is checked ON.

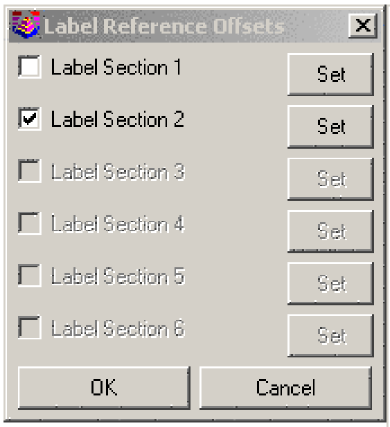
Grid Bottom Elevation: Specify actual bottom elevation for each section grid. This option is only available when Fit Each Vertical Grid is checked OFF.

Vertical Grid Height: Specify actual grid height for each section grid. This option is only available when Fit Each Vertical Grid is checked OFF.

Vertical Space Between Grids: Specify the distance the sections are stacked above the last one plotted when the Vertical Stack option is specified.

Maximum Sections Per Column: Sets the maximum number of sections allowed per column when the Vertical Stack option is specified.

Label Reference Offsets: When enabled, the offset from selected break points of one section file relative to the position(s) of selected points from another section file can be labeled onto the plots.


Label Reference Offsets

☐ Label Section 1

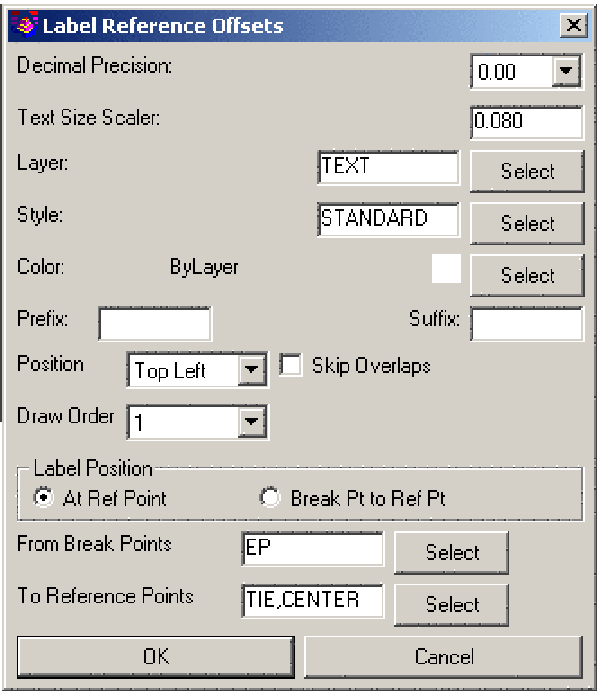
☑ Label Section 2

☐ Label Section 3

☐ Label Section 4

☐ Label Section 5

☐ Label Section 6


Label Reference Offsets

Decimal Precision: 0.00

Text Size Scaler: 0.080

Layer: TEXT

Style: STANDARD

Color: ByLayer

Prefix:

Suffix:

Position: Top Left

☐ Skip Overlaps

Draw Order: 1

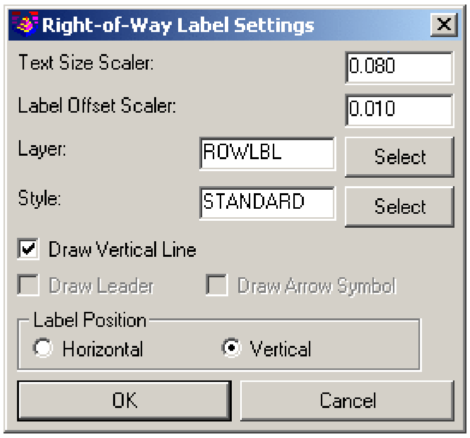
Label Position

● At Ref Point ○ Break Pt to Ref Pt

From Break Points: EP

To Reference Points: TIE,CENTER

Label Right of Way: When enabled, this option will label Right of Way points as defined using the Section Points from Right of Way command. Press the **Set** button to the right of this toggle to set the text size and label offset scalers, layer and text style settings.


Right-of-Way Label Settings

Text Size Scaler: 0.080

Label Offset Scaler: 0.010

Layer: ROWLBL

Style: STANDARD

☑ Draw Vertical Line

☐ Draw Leader ☐ Draw Arrow Symbol

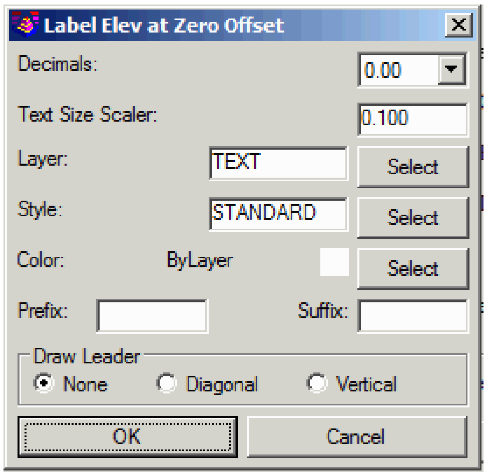
Label Position: ○ Horizontal ● Vertical

Draw Vertical Line: Places a vertical line, from top to bottom, through the Right-of-Way point.

Draw Leader/Draw Arrow Symbol: When enabled, a short vertical line is drawn, with or without, the arrowhead through the Right-of-Way point.

Label Position: Indicate the desired orientation of the "ROW" text label.

Label Elevation at Zero Offset: Will label the section elevation at offset zero. The label is drawn on the section grid just above the section line. Press the **Set** button to the right of this toggle to set the display precision, text size scaler, prefix, suffix, color and layer for these labels. The Draw Leader option can be set to None, Diagonal or Vertical.


Label Elev at Zero Offset

Decimals: 0.00

Text Size Scaler: 0.100

Layer: TEXT

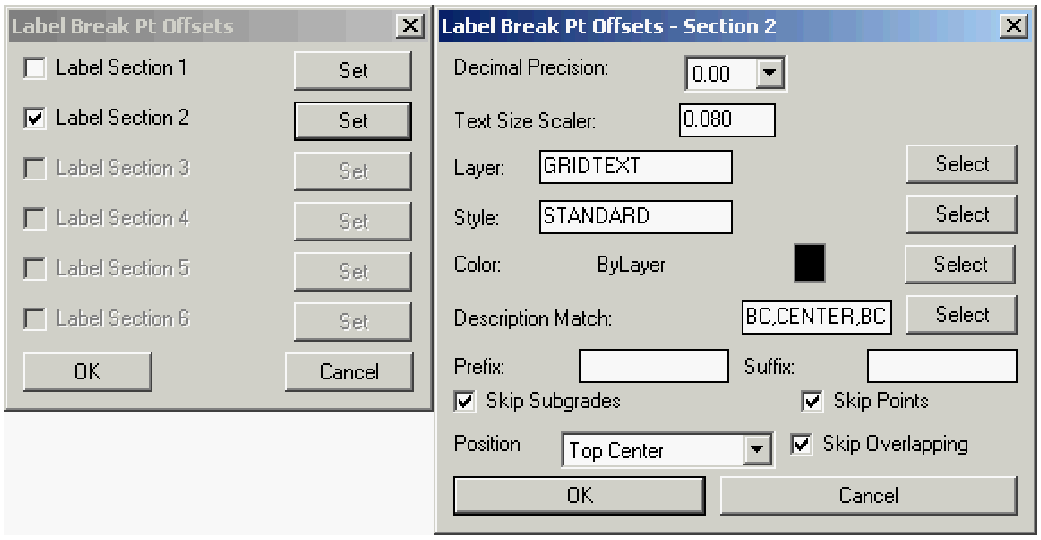
Style: STANDARD

Color: ByLayer

Prefix: Suffix:

Draw Leader: ● None ○ Diagonal ○ Vertical

Label Break Pt Offsets: Will label these values along the section line above each point in the section. Press the **Set** button to the right of this toggle to set the display precision, text size scaler and layer for these labels.

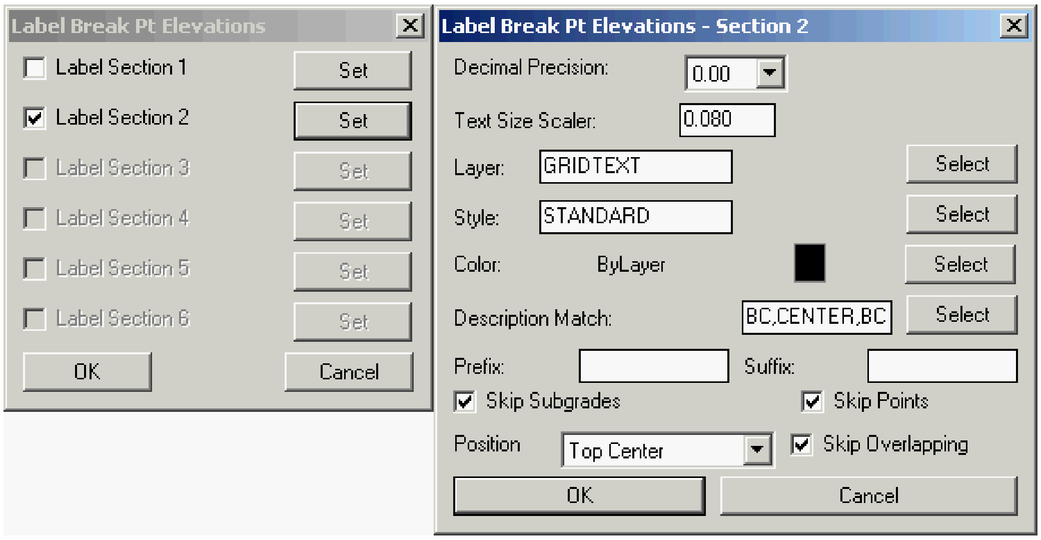

Label Break Pt Offsets

☐ Label Section 1
☑ Label Section 2
☐ Label Section 3
☐ Label Section 4
☐ Label Section 5
☐ Label Section 6

Label Break Pt Offsets - Section 2

Decimal Precision: 0.00
Text Size Scaler: 0.080
Layer: GRIDTEXT
Style: STANDARD
Color: ByLayer
Description Match: BC,CENTER,BC
Prefix:
Suffix:
☑ Skip Subgrades
☑ Skip Points
Position: Top Center
☑ Skip Overlapping

Label Break Pt Elevations: Will label these values along the section line above each point in the section. Press the **Set** button to the right of this toggle to set the display precision, text size scaler and layer for these labels.

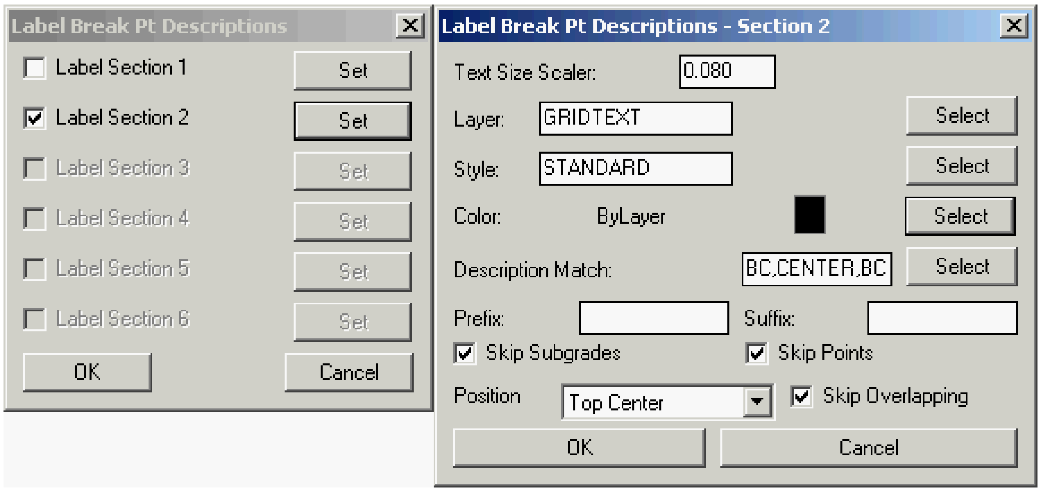

Label Break Pt Elevations

☐ Label Section 1
☑ Label Section 2
☐ Label Section 3
☐ Label Section 4
☐ Label Section 5
☐ Label Section 6

Label Break Pt Elevations - Section 2

Decimal Precision: 0.00
Text Size Scaler: 0.080
Layer: GRIDTEXT
Style: STANDARD
Color: ByLayer
Description Match: BC,CENTER,BC
Prefix:
Suffix:
☑ Skip Subgrades
☑ Skip Points
Position: Top Center
☑ Skip Overlapping

Label Break Pt Descriptions: Will label these values along the section line above each point in the section. Press the **Set** button to the right of this toggle to set the text size scaler, layer, and description match for these labels.

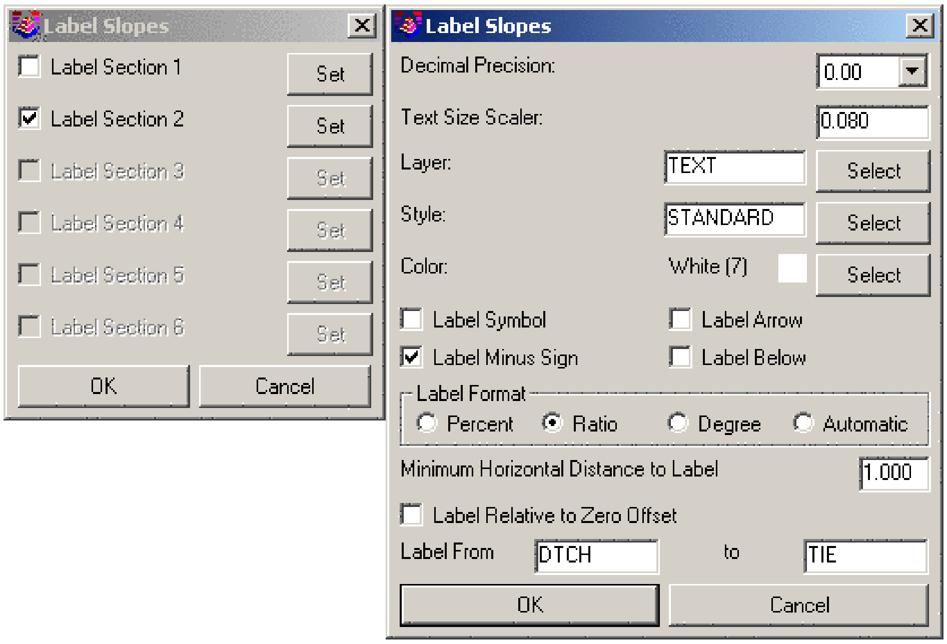

Label Break Pt Descriptions

☐ Label Section 1
☑ Label Section 2
☐ Label Section 3
☐ Label Section 4
☐ Label Section 5
☐ Label Section 6

Label Break Pt Descriptions - Section 2

Text Size Scaler: 0.080
Layer: GRIDTEXT
Style: STANDARD
Color: ByLayer
Description Match: BC,CENTER,BC
Prefix:
Suffix:
☑ Skip Subgrades
☑ Skip Points
Position: Top Center
☑ Skip Overlapping

Label Slopes: Will label cross-slope values of the Section. Press the **Set** button to the right of this toggle to set the text and symbol size scaler, layer, and label format for these labels. Enable the **Label Relative to Zero Offset** option to ensure slopes are measured from the zero offset line out to the extents of the Section. Also, if you do not want all slopes on the Section labeled, you can use the "Label From" and "to" settings to specify Section point descriptions to label between. For instance, you could specify to only label the slope between the SW (sidewalk) and SH (shoulder) ID points as defined in the Template file (.tpl) that was used to generate your Section file (.sct).



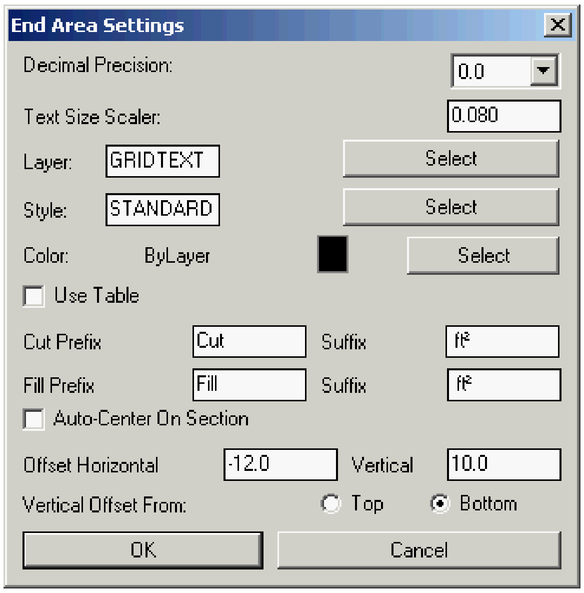
Label Slopes

☐ Label Section 1
☑ Label Section 2
☐ Label Section 3
☐ Label Section 4
☐ Label Section 5
☐ Label Section 6

Label Slopes

Decimal Precision: 0.00
Text Size Scaler: 0.080
Layer: TEXT
Style: STANDARD
Color: White (7)
☐ Label Symbol
☐ Label Arrow
☑ Label Minus Sign
☐ Label Below
Label Format: ○ Percent ● Ratio ○ Degree ○ Automatic
Minimum Horizontal Distance to Label 1.000
☐ Label Relative to Zero Offset
Label From DTCH to TIE

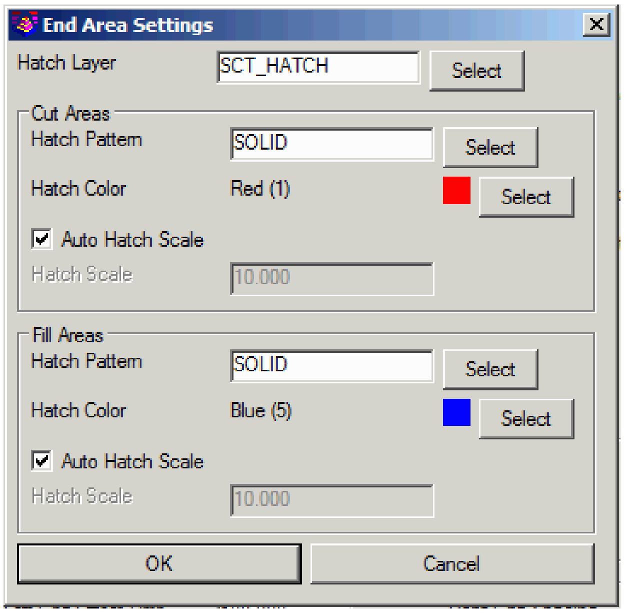
Label End Areas: Will label cut and fill end areas on each section. Or, if the **Use Table** option is enabled, cut and fill end areas will be placed in a table.



End Area Settings

Decimal Precision: 0.0
Text Size Scaler: 0.080
Layer: GRIDTEXT
Style: STANDARD
Color: ByLayer
☐ Use Table
Cut Prefix Cut Suffix ft²
Fill Prefix Fill Suffix ft²
☐ Auto-Center On Section
Offset Horizontal -12.0 Vertical 10.0
Vertical Offset From: ○ Top ● Bottom

Hatch End Areas: This option hatches the cut/fill areas between the first and section section files. The program treats the first section as existing and the second as design for determining cut verses fill. There are separate hatch pattern, color and scale settings for cut and fill.


End Area Settings

Hatch Layer: SCT_HATCH

Cut Areas
Hatch Pattern: SOLID
Hatch Color: Red (1) 🟥
☑ Auto Hatch Scale
Hatch Scale: 10.000

Fill Areas
Hatch Pattern: SOLID
Hatch Color: Blue (5) 🟦
☑ Auto Hatch Scale
Hatch Scale: 10.000

Draw Break Pt Leader: Enable this option to include a leader with the Label Break Pt Offsets, Label Break Pt Elevations or Label Break Pt Descriptions options. Click the **Set** button to specify the desired layer for the leader.

Note:

- When redrawing sections, the program retains any custom edits to label and leader positions.

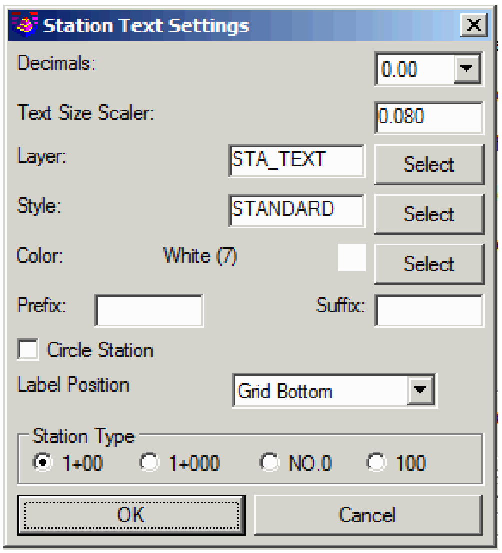
Draw Break Pt Symbol: Enable this option to include a symbol with the Label Break Pt Offsets, Label Break Pt Elevations or Label Break Pt Descriptions options. Click the **Set** button (to the immediate right of the Layer control) to specify the desired layer for the symbol. Click the **Set** button (to the immediate right of the Symbol control) to specify the desired symbol and indicated the desired Size Scalar.

Break Pt Label Offset: Indicate the desired offset amount from the surface break point to its label.

Plot Grid: Uncheck this toggle if you do not want the grid to plot.

Text Only: Check this toggle if you only want to plot the cross section polyline and the grid text. This can be useful for plotting on a section sheet that has pre-plotted grid lines and you want to plot only the section and text.

The **Station Settings** button displays another dialog for the station label settings including decimal places, size, layer, style, color, prefix, suffix, format type and position. The **Circle Station** option will draw a circle around the station label.


Station Text Settings

Decimals: 0.00
Text Size Scaler: 0.080
Layer: STA_TEXT
Style: STANDARD
Color: White (7) ⬜
Prefix:
Suffix:
☐ Circle Station
Label Position: Grid Bottom

Station Type
● 1+00 ○ 1+000 ○ NO.0 ○ 100

Label Scale: Will label the horizontal and vertical scale with the first section on each sheet.

Left Grid Offset Limit: Specify the length the grid lines are plotted to the left from the centerline or zero offset.

Right Grid Offset Limit: Specify the length the grid lines are plotted to the right from the centerline or zero offset.

Station Text Size Scaler: Specify the text size scaler for the station text. This value is multiplied by the horizontal scale to obtain the final text height. For example, if you set Station Text Size to 0.10 and the horizontal scale is 100.0, then the text height will be (0.10 $*$ 100) or 10.0.

Grid Text Size Scaler: Specify the text size scaler for the axis text. This value is multiplied by the horizontal scale to obtain the final text height. For example, if you set Axis Text Size to 0.08 and the horizontal scale is 50.0, then the text height will be (0.08 $*$ 50) or 4.0.

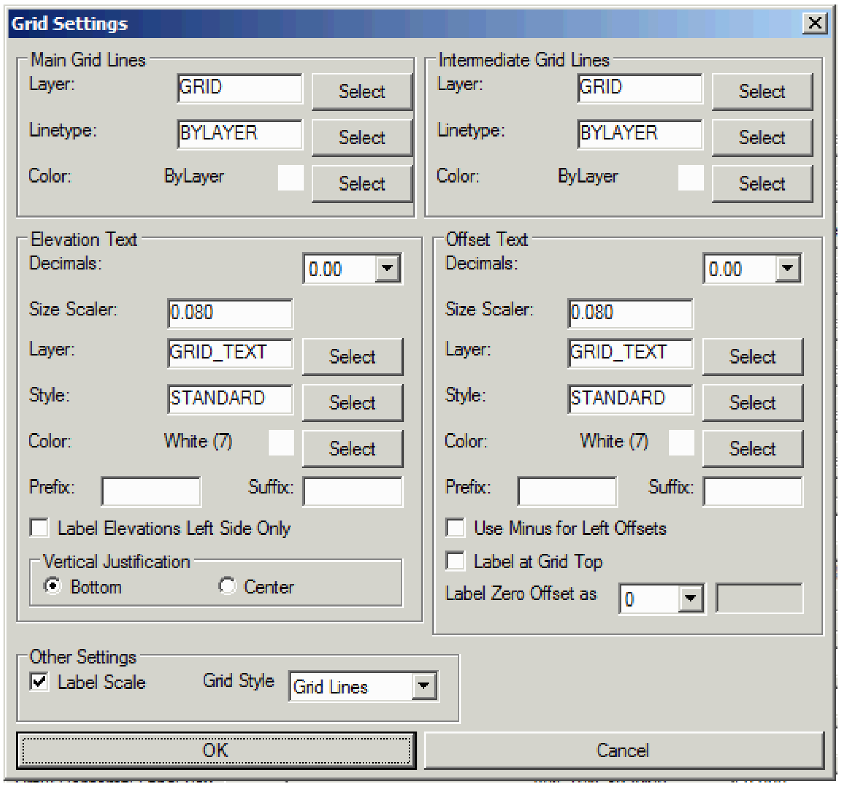
Horiz Grid Spacing: Specify the distance the vertical lines of the grid will be spaced.

Horiz Text Spacing: Specify the interval that text will be plotted below the grid lines.

Vert Grid Spacing: Specify the distance the horizontal lines of the grid will be spaced.

Vert Text Spacing: Specify the interval that text will be plotted to the left and right of the grid lines.

Grid Settings: Click this button to establish how text annotation is configured for the grid. There are setting for the grid lines and text for layer, linetype, color, decimals, style, size, prefix and suffix. **Label Elevations Left Side Only:** Enable this option if elevation labels are desired only on the left side of each section. **Use Minus for Left Offsets:** Enabling this option will show a minus sign (-) in front of all left offset distances. **Label Zero Offset as:** Use this setting to label the Zero Offset as "0", "C/L" or "Other" to specify a custom label. **Grid Style:** When using either the Vertical Stack option or the Pick Location option, indicate the desired style for the grid markings.


Grid Settings

Main Grid Lines
Layer: GRID
Linetype: BYLAYER
Color: ByLayer

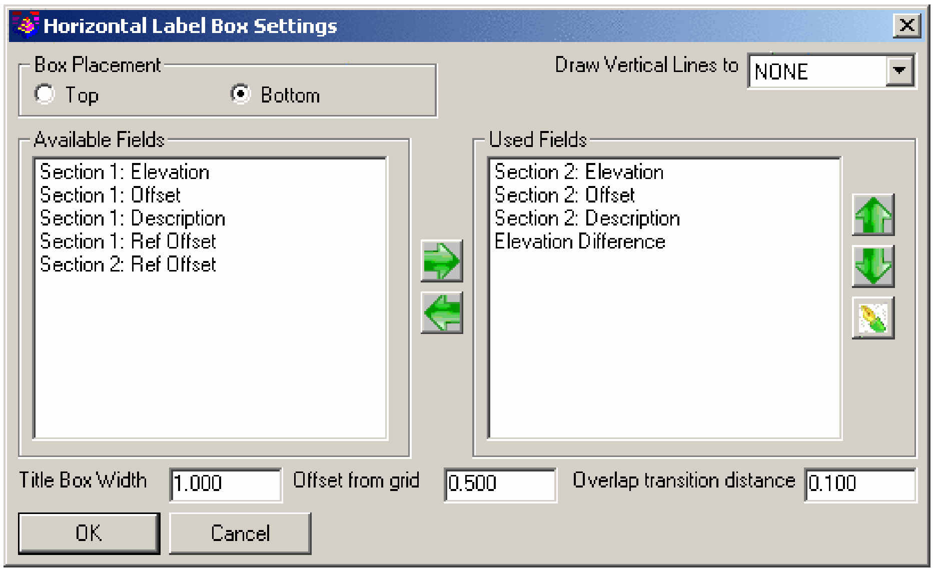
Intermediate Grid Lines
Layer: GRID
Linetype: BYLAYER
Color: ByLayer

Elevation Text
Decimals: 0.00
Size Scaler: 0.080
Layer: GRID_TEXT
Style: STANDARD
Color: White (7)
Prefix:
Suffix:
☐ Label Elevations Left Side Only
Vertical Justification
● Bottom ○ Center

Offset Text
Decimals: 0.00
Size Scaler: 0.080
Layer: GRID_TEXT
Style: STANDARD
Color: White (7)
Prefix:
Suffix:
☐ Use Minus for Left Offsets
☐ Label at Grid Top
Label Zero Offset as 0

Other Settings
☑ Label Scale
Grid Style Grid Lines

Draw Horizontal Label Box: Enabling this option will draw a table with desired labeling above or below each cross-section. By picking the **Set** button to the right, you can choose the data to be placed in the table. The Elevation, Offset and Description of each point on the cross section can be added to the table. If more than one Section file (.sct) is being drawn on the cross-section, you will also have the option of displaying the elevation difference between sections.



Horizontal Label Box Settings

Box Placement: ○ Top ● Bottom

Draw Vertical Lines to: NONE

Available Fields:
- Section 1: Elevation
- Section 1: Offset
- Section 1: Description
- Section 1: Ref Offset
- Section 2: Ref Offset

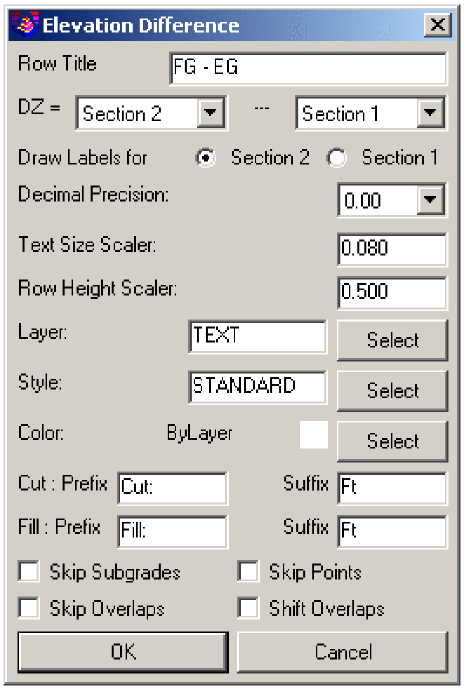
Used Fields:
- Section 2: Elevation
- Section 2: Offset
- Section 2: Description
- Elevation Difference

Title Box Width: 1.000

Offset from grid: 0.500

Overlap transition distance: 0.100

In the ***Draw Horizontal Label Box*** dialog, select from the **Available Fields** in the list on the left to populate the list of **Used Fields** on the right side. Once an item has been moved to the list of **Used Fields**, you can double-click on the Field to change settings and format for each Field. An example of the **Elevation Difference** option is shown below:



Elevation Difference

Row Title: FG - EG

DZ = Section 2 -- Section 1

Draw Labels for: ● Section 2 ○ Section 1

Decimal Precision: 0.00

Text Size Scaler: 0.080

Row Height Scaler: 0.500

Layer: TEXT

Style: STANDARD

Color: ByLayer

Cut : Prefix: Cut: Suffix: Ft

Fill : Prefix: Fill: Suffix: Ft

☐ Skip Subgrades ☐ Skip Points

☐ Skip Overlaps ☐ Shift Overlaps

The **Row Title** for each field can be edited from the default to show a descriptive title. The **DZ** value in the Elevation Difference settings dialog allows you to specify which Section's elevations are to be subtracted from the other. This setting is critical to return the correct cut and fill depth values. In all field settings boxes, you have the ability to skip surface points in order to make the data more legible.

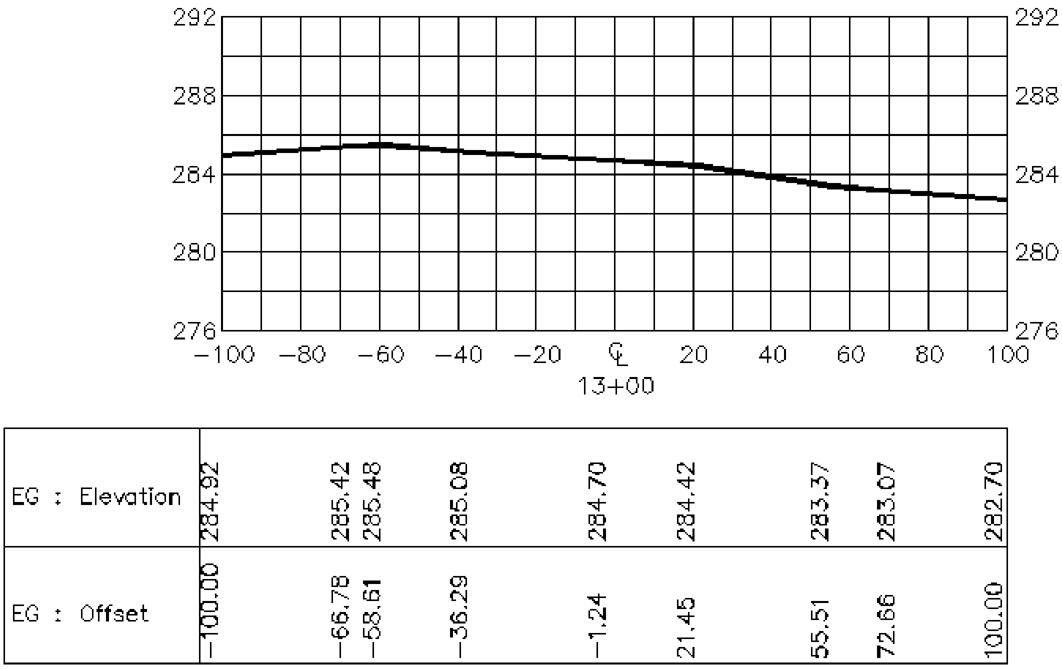
Skip Subgrades: Enable this option to skip all subgrades as may have been defined in Design Template files (.tpl).

Skip Points: Enable this option to skip points in the Section file (.sct) that were created using any of the **Create Section Points...** commands.

Skip Overlaps: Enabling this option will cause any overlapping text in the table to be skipped. Having this option enabled will disable the Shift Overlaps option.

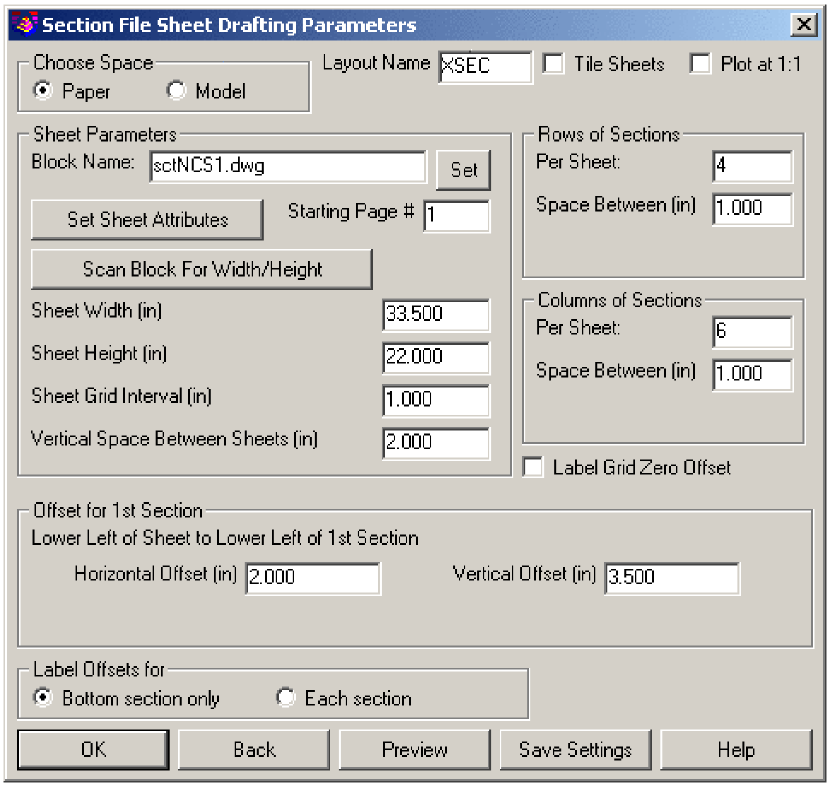
Shift Overlaps: Enabling this option will shift any text in the table to the right so that it does not overlap preceding text.

A sample cross-section with **Horizontal Label Box** is shown below:



Select the OK button to continue. If the Vertical Stack option was selected, the sections are immediately drawn to the active "space" (*e.g.* the Model or Layout) with the bottom center of the first section getting placed at 0,0. If the Pick Location option was specified, you will be prompted to specify the base location for each section. If the Sheets option was selected, the Sheet Drafting Parameters dialog box appears allowing you to specify all the settings for sheet plotting.

Section File Sheet Drafting Parameters



Section File Sheet Drafting Parameters

Choose Space
● Paper ○ Model

Layout Name: XSEC
☐ Tile Sheets
☐ Plot at 1:1

Sheet Parameters
Block Name: sctNCS1.dwg
Starting Page #: 1
Sheet Width (in): 33.500
Sheet Height (in): 22.000
Sheet Grid Interval (in): 1.000
Vertical Space Between Sheets (in): 2.000

Rows of Sections
Per Sheet: 4
Space Between (in): 1.000

Columns of Sections
Per Sheet: 6
Space Between (in): 1.000

☐ Label Grid Zero Offset

Offset for 1st Section
Lower Left of Sheet to Lower Left of 1st Section
Horizontal Offset (in): 2.000
Vertical Offset (in): 3.500

Label Offsets for
● Bottom section only ○ Each section

Choose Space: Indicate whether sheets are to be drawn to Paper Space (also known as a Layout) or to **Model** Space.

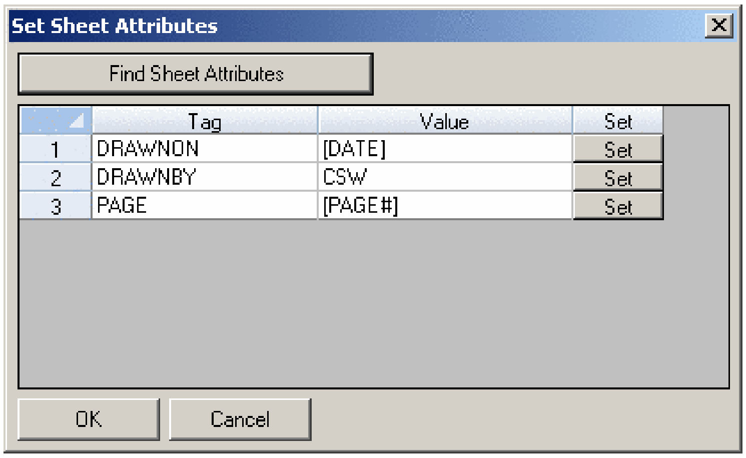
Layout Name: Indicate the name of the layout to which the first sheet should be drawn.

Tile Sheets: Enabling this option places all sheets in the specified **Layout Name**. The result is a vertical stack of sheets in the layout. Disabling this option allows additional layouts to be created each containing one sheet. As additional layouts are created, the name of each successive layout is incremented by a value of 1.

Plot at 1:1: Enabling this option draws the sections so that one unit horizontally in the section is equivalent to one plotted unit. The ratio of the Horizontal Scale:Vertical Scale determines the amount of vertical exaggeration.

Block Name: Specify the drawing name that will be inserted for each sheet. The default is SCTSHT1 which is included with Carlson Software and is located in the **%AppData%****Carlson Software****...****Sup**\ folder. You can use this or use a sheet block of your own design. The block should be drawn at a 1:1 scale since the program inserts it using the Horizontal Scale setting from the previous dialog. Click the **Set** button to browse/navigate to an alternate drawing file.

Set Sheet Attributes: For grid sheet block names that utilize attributes (useful for items such as sheet numbers, drawn date, drawn by, job name, *etc*), use this command to provide attribute values that will be placed for each sheet block:



	Tag	Value	Set
1	DRAWNON	[DATE]	Set
2	DRAWNBY	CSW	Set
3	PAGE	[PAGE#]	Set

Find Sheet Attributes: This routine will scan the Block Name for any attribute definitions and return them to the dialog box so values can be established for each attribute.

Starting Page #: Indicate the starting page number to be applied to the plots through the use of the Set Sheet Attributes command.

Scan Block for Width/Height: Use this routine to scan the specified Block Name for its width and height. These values are populated into the Sheet Width and Sheet Height controls.

Sheet Grid Interval: Indicate the spacing between the grid lines in the sheet block. The routine will not draw the grid lines and uses this information to control the placement of each section onto the sheet.

Vertical Space Between Sheets: Indicate the amount of space that should be placed between sheets when the Tile Sheets option is enabled.

Rows of Sections
Per Sheet: Specify the maximum number of sections that can be stacked on top of each other on a sheet.
Space Between: Specify how much space will be placed between the top of the last section plotted and the bottom of the next section. For U.S. Customary based units, a value of 1 would be a good starting value.

Columns of Sections
Per Sheet: Specify how many columns of sections can be placed on each sheet.
Space Between: Specify the distance between the left edge of one section column edge and the right edge of the next column. This will generally be the area where elevation labels and station circle annotation will be placed. For U.S. Customary based units, a value of 2 would be a good starting value.

Label Grid Zero Offset: Enable this toggle if the zero offset location of each section should be labeled on each section.

Offset for 1st Section
Horizontal Offset: Specify how far from left edge of the sheet the first section will be placed on to the section sheet. The block SCTSHT1 has a 1" left margin.
Vertical Offset: Specify how far from bottom edge of the sheet the first section will be placed on to the section sheet. The block SCTSHT1 has a 1/2" bottom margin.

Preview: This button allows you to get an approximate idea of what the initial sheet will look like based on the current settings.

Back: This button allows you to return focus to the main dialog and make changes to any previous settings or cancel the routine.

Save Settings: This button allows you to save all the parameters settings to a file so you can easily recall them for another project.

Prompts

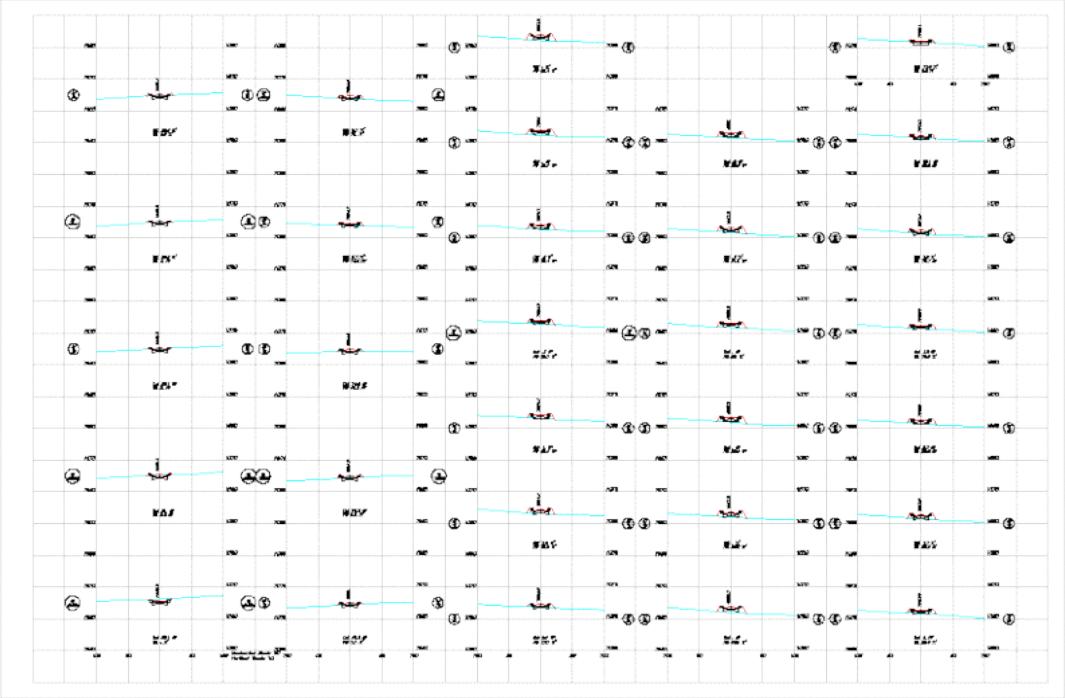
If the Pick Location option was specified, the program scans the station data and determines the minimum and maximum elevations, and proposes a datum elevation. If you have pre-plotted a grid sheet and want to reference another local grid coordinate, then change the datum elevation appropriately. The Pick Location type of plotting has the following prompts:

Station> 25.000 Min Elev> 1055.301 Max Elev> 1057.068
Change datum elev/<Select point that represents 0 offset elev 1050.0>: *Pick a point*
Station> 50.000 Min Elev> 1055.557 Max Elev> 1057.324
Change datum elev/<Select point that represents 0 offset elev 1050.0>: *Pick a point*

The program continues to prompt until the last station in the range specified is drawn. You can use the Cancel function (the *Esc* key) to stop plotting, if necessary.

If the Sheets option was specified with Model space as the destination, you can choose where to insert the sheet(s):

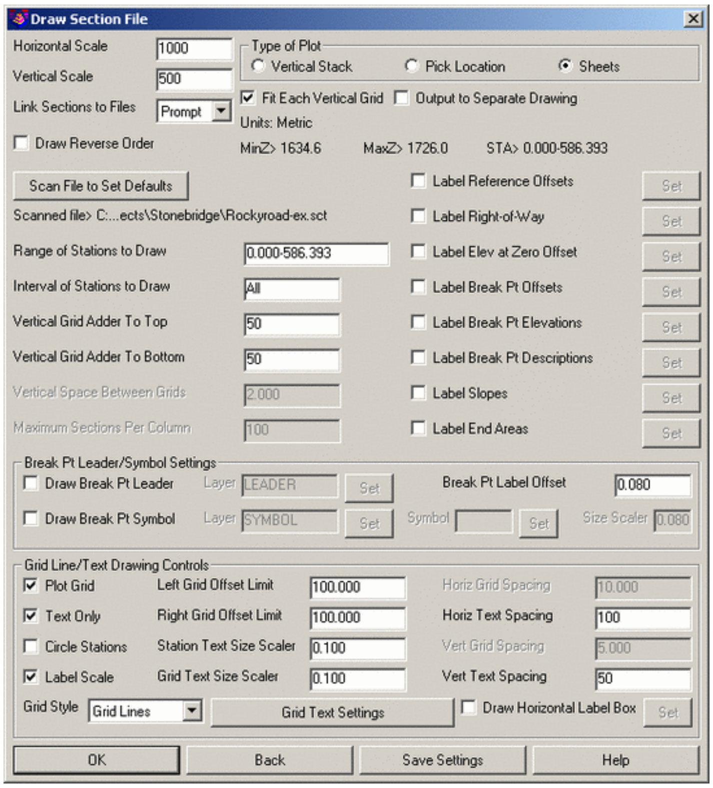
Select Starting Point for Row of Sheets <0.0,0.0>: *Pick a point or press Enter to accept the default value specified*



Sheet Sample

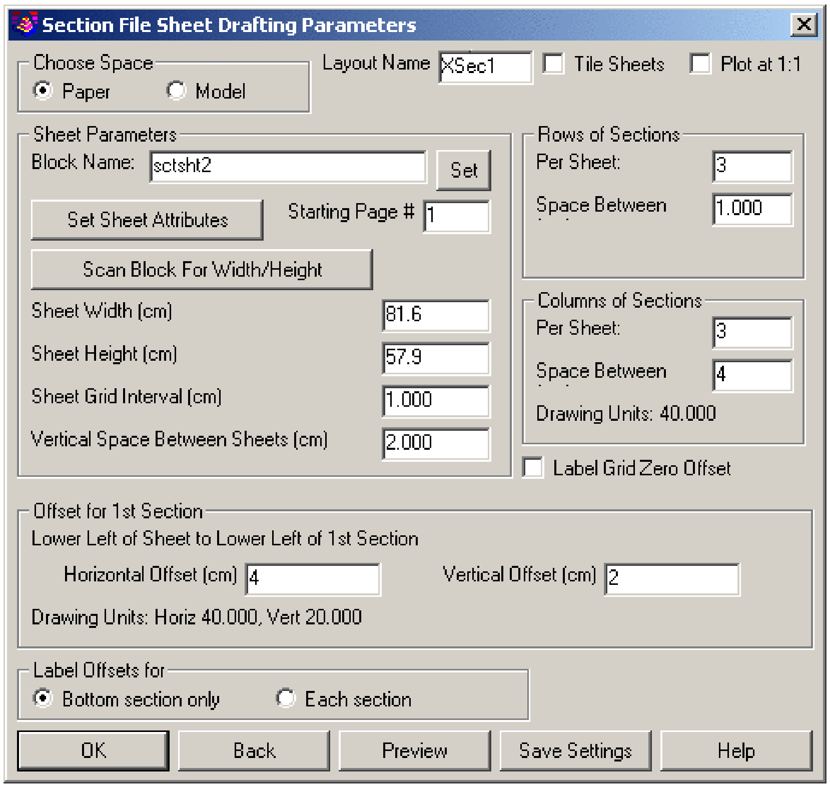
Drawing Metric Section Sheets

First, be sure that you are set to metric mode in Drawing Setup under the Settings menu. For our example, assume a 1:1000 horizontal scale. Once set, issue the Draw Section File command and click OK to reach the second dialog. There is a different block name for metric sections called schsht2.dwg which is located in the **%AppData%****Carlson Software****...****Sup**\ folder. Begin by setting the parameters for the second dialog as shown.


Draw Section File

Horizontal Scale: 1000
Vertical Scale: 500
Link Sections to Files: Prompt
☐ Draw Reverse Order
Type of Plot: ○ Vertical Stack ○ Pick Location ● Sheets
☑ Fit Each Vertical Grid ☐ Output to Separate Drawing
Units: Metric
MinZ> 1634.6 MaxZ> 1726.0 STA> 0.000-586.393
Scanned file> C:...ects\Stonebridge\Rockyroad-ex.sct
Range of Stations to Draw: 0.000-586.393
Interval of Stations to Draw: All
Vertical Grid Adder To Top: 50
Vertical Grid Adder To Bottom: 50
Vertical Space Between Grids: 2.000
Maximum Sections Per Column: 100
☐ Label Reference Offsets
☐ Label Right-of-Way
☐ Label Elev at Zero Offset
☐ Label Break Pt Offsets
☐ Label Break Pt Elevations
☐ Label Break Pt Descriptions
☐ Label Slopes
☐ Label End Areas
Break Pt Leader/Symbol Settings
☐ Draw Break Pt Leader, Layer: LEADER
Break Pt Label Offset: 0.080
☐ Draw Break Pt Symbol, Layer: SYMBOL
Symbol:
Size Scaler: 0.080
Grid Line/Text Drawing Controls
☑ Plot Grid
☑ Text Only
☐ Circle Stations
☑ Label Scale
Left Grid Offset Limit: 100.000
Right Grid Offset Limit: 100.000
Station Text Size Scaler: 0.100
Grid Text Size Scaler: 0.100
Horiz Grid Spacing: 10.000
Horiz Text Spacing: 100
Vert Grid Spacing: 5.000
Vert Text Spacing: 50
Grid Style: Grid Lines
☐ Draw Horizontal Label Box

Second dialog with metric settings


Section File Sheet Drafting Parameters

Choose Space: ● Paper ○ Model
Layout Name: XSec1
☐ Tile Sheets ☐ Plot at 1:1
Sheet Parameters
Block Name: sctsht2
Starting Page #: 1
Sheet Width (cm): 81.6
Sheet Height (cm): 57.9
Sheet Grid Interval (cm): 1.000
Vertical Space Between Sheets (cm): 2.000
Rows of Sections
Per Sheet: 3
Space Between: 1.000
Columns of Sections
Per Sheet: 3
Space Between: 4
Drawing Units: 40.000
☐ Label Grid Zero Offset
Offset for 1st Section
Lower Left of Sheet to Lower Left of 1st Section
Horizontal Offset (cm): 4
Vertical Offset (cm): 2
Drawing Units: Horiz 40.000, Vert 20.000
Label Offsets for: ● Bottom section only ○ Each section

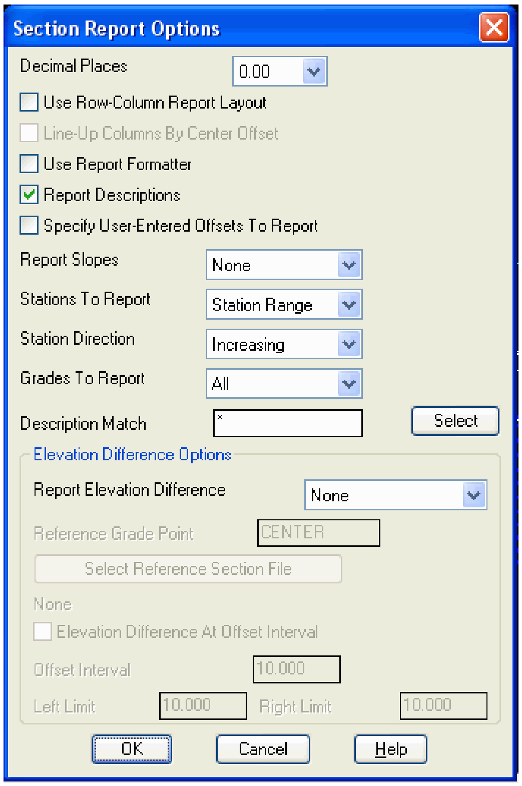
Third dialog with metric settings

Adjust settings as needed to achieve the desired look/layout.

Pulldown Menu Location(s): Civil > Sections, Field > Roads
Keyboard Command: drawsct
Prerequisite: A Section (.sct) file

Section Report

This command generates a report of a section file for the specified stations. The information contained in the report is determined by the settings in the Section Report Options dialog box.



Section Report Options

Decimal Places: 0.00
☐ Use Row-Column Report Layout
☐ Line-Up Columns By Center Offset
☐ Use Report Formatter
☑ Report Descriptions
☐ Specify User-Entered Offsets To Report
Report Slopes: None
Stations To Report: Station Range
Station Direction: Increasing
Grades To Report: All
Description Match: *

Elevation Difference Options
Report Elevation Difference: None
Reference Grade Point: CENTER
None
☐ Elevation Difference At Offset Interval
Offset Interval: 10.000
Left Limit: 10.000
Right Limit: 10.000

Decimal Places: Specify the display precision for stations and elevations.

Use Row-Column Report Layout: When checked, offsets are reported in columns. Example reports showing the difference are shown below. Also when active, there is an option to **Line-Up Columns By Center Offset** which makes the zero offset column line up. Otherwise, the columns are lined up by the left most offset.

Use Report Formatter: Report output is directed to the Report Formatter which allows for custom reports, as well as being able to export the report to Microsoft Excel or Access.

Report Descriptions: Controls whether the descriptions for each section point are reported.

Specify User-Entered Offsets To Report: After choosing OK from this dialog, the program will prompt for additional offsets to report with interpolated elevations. These are for offsets that don't already exist as section points in the section file.

Report Slopes: Will report the slope between section points. Specify how to report the slopes, either none, percent, ratio, or auto format. Auto format means that slopes less than 10% are reported in percent, while greater slopes are reported as ratios.

Stations to Report: Specify either a range and interval of stations to report or enter each station one at a time.

Station Direction: This setting controls the order of the stations for the report.

Grades to Report: This applies to section files that contain subgrades. For these section files, you can choose which grades to report (top surface or subgrades). All is also an option.

Description Match: This field can be used to filter the section points by their description.

Report Elevation Difference: Reports section elevations by Reference Grade Point, Section File or choose none.

Reference Grade Point: Specify the reference grade ID. Only available if Grade Point option is selected, as mentioned above.

Select Reference Section File: Specify a reference file. Only available if Section File is chosen, as mentioned above.

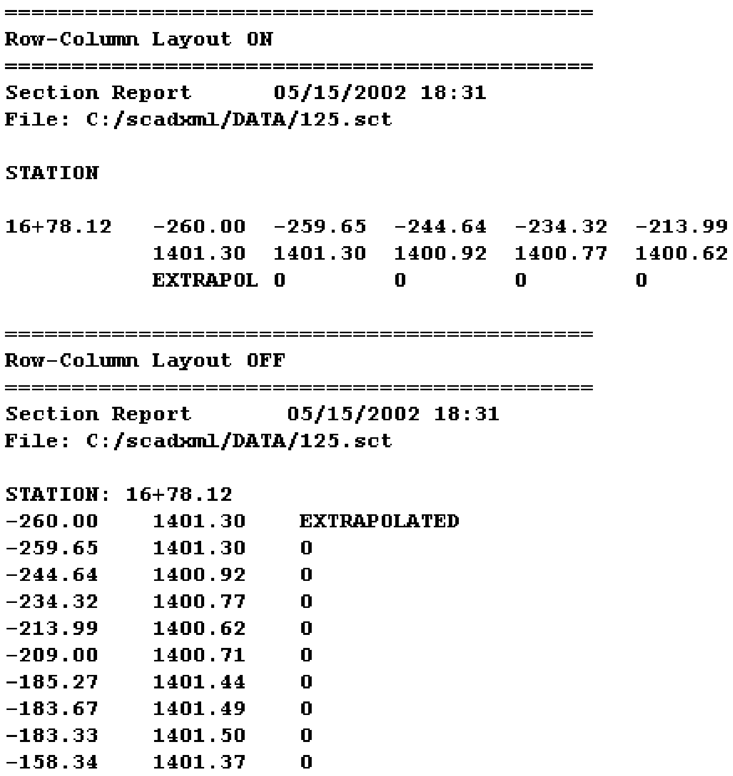
Elevation Difference at Offset Interval: Used if there is an elevation difference.
The next three options only available if Elevation Difference at Offset Interval is clicked**.**

Offset Interval: Value required.

Left Limit/Right Limit: Values required.

Prompts

Section Report Options dialog *choose options*
Section File to Report dialog *choose existing file*
Starting station for report <0.000>: *press Enter*
Ending station for report <1147.478>: *press Enter*
Station interval (A for All) <100.0>: *press Enter*



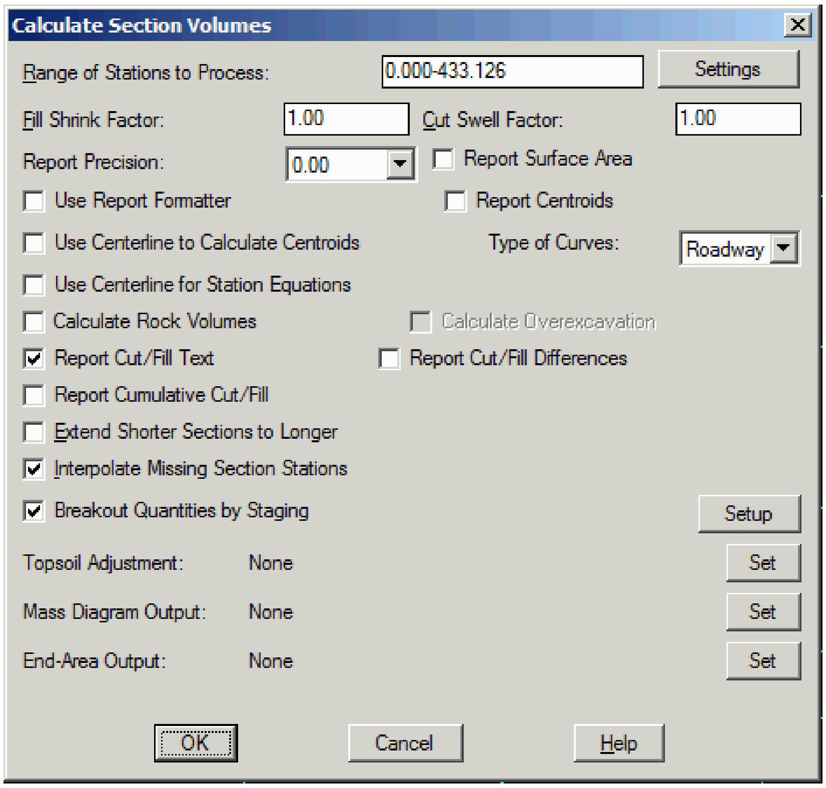
```
==========================================
Row-Column Layout ON
==========================================
Section Report      05/15/2002 18:31
File: C:/scadxml/DATA/125.sct

STATION

16+78.12   -260.00  -259.65  -244.64  -234.32  -213.99
           1401.30  1401.30  1400.92  1400.77  1400.62
           EXTRAPOL 0        0        0        0

==========================================
Row-Column Layout OFF
==========================================
Section Report       05/15/2002 18:31
File: C:/scadxml/DATA/125.sct

STATION: 16+78.12
-260.00    1401.30    EXTRAPOLATED
-259.65    1401.30    0
-244.64    1400.92    0
-234.32    1400.77    0
-213.99    1400.62    0
-209.00    1400.71    0
-185.27    1401.44    0
-183.67    1401.49    0
-183.33    1401.50    0
-158.34    1401.37    0
```

Sample Report

Pulldown Menu Location: Sections
Keyboard Command: sctrprt
Prerequisite: A section file (.sct)

Calculate Section Volumes

This command will read two section files and compute the cut and fill end areas and volumes. It computes the sections volume in the order they appear in the file. If you need to sort the stations in sequential order use the *Input-Edit Section File* command. Begin by selecting the base section file then the final section file. After specifying the input files the Calculate Section Volumes dialog appears. The settings can then chosen and customized to match your reporting needs. There is an option to apply topsoil removal/replacement adjustments, as well as support for processing sections with subgrades.


Calculate Section Volumes

Range of Stations to Process: 0.000-433.126

Fill Shrink Factor: 1.00

Cut Swell Factor: 1.00

Report Precision: 0.00

☐ Report Surface Area

☐ Use Report Formatter

☐ Report Centroids

☐ Use Centerline to Calculate Centroids

Type of Curves: Roadway

☐ Use Centerline for Station Equations

☐ Calculate Rock Volumes

☐ Calculate Overexcavation

☑ Report Cut/Fill Text

☐ Report Cut/Fill Differences

☐ Report Cumulative Cut/Fill

☐ Extend Shorter Sections to Longer

☑ Interpolate Missing Section Stations

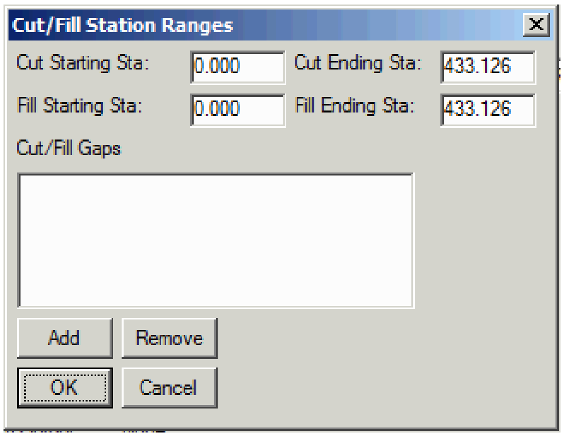
☑ Breakout Quantities by Staging

Topsoil Adjustment: None

Mass Diagram Output: None

End-Area Output: None

Range of Stations to Process: Specify the range of stations to process. Separate stations with a hyphen as shown. The Settings button brings up another dialog with more station options:


Cut/Fill Station Ranges

Cut Starting Sta: 0.000

Cut Ending Sta: 433.126

Fill Starting Sta: 0.000

Fill Ending Sta: 433.126

Cut/Fill Gaps

Cut/Fill Starting/Ending Sta.: Volumes are calculated using end areas between the range of stations. Instead of cutting off the volumes exactly at this range, the Ending and Starting Stations for Cut and Fill can be used to have the volume taper from zero at the specified Starting Station to the volume at the first station in the range. Likewise, the Ending Stations can be used to taper the volume from the last station in the range to zero at the specified Ending Station.

Cut/Fill Gaps: Use the Add and Remove buttons to define a series of station ranges for cut/fill gaps where the program will not calculate any volumes.

Fill Shrink/Cut Swell Factor: Allows you to specify a value that the volume calculated will be multiplied by.

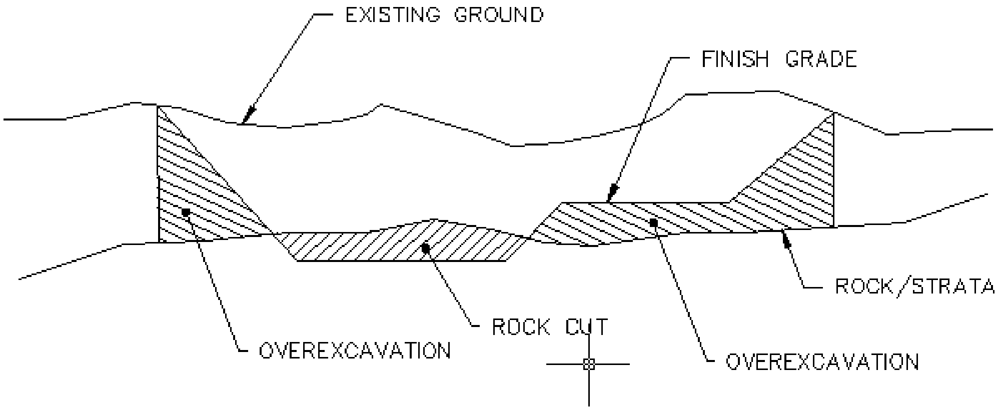
Report Precision: Specify the decimal precision for the report.

Use Centerline to Calculate Centroids: When checked, the program will calculate the centroids using a centerline (.CL) file. You will be prompted to select the centerline file.

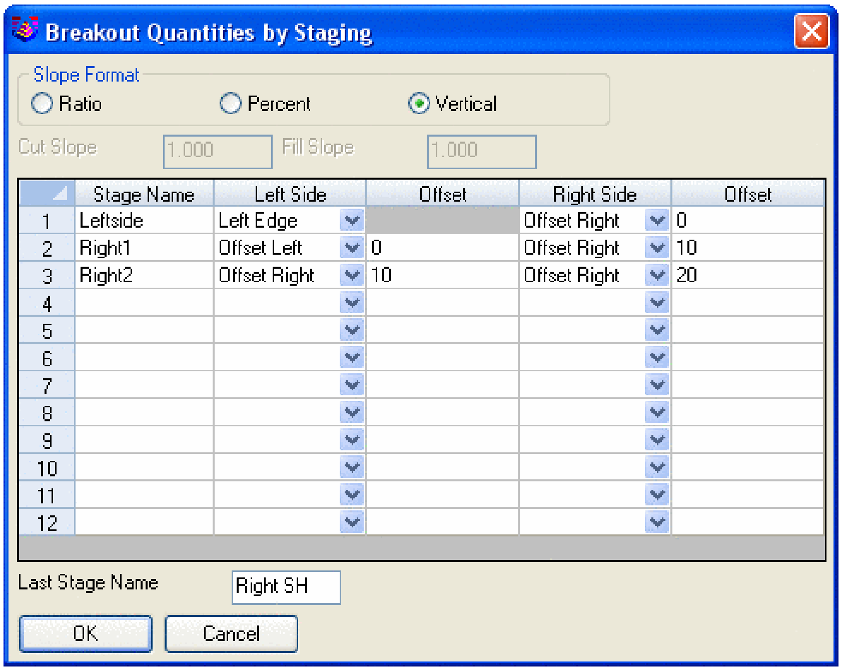
Use Centerline for Station Equations: This option applies to section files with stations numbered using station equations. This option will use the station equations defined in a centerline file to remove the station equations from the section file stations for calculating the true end area distances. You will be prompted to select the centerline file.

Use Report Formatter: This option allows for customized report layout and contents. Otherwise a standard report

is displayed.
Report Centroids: Specify whether or not to report centroids.
Calculate Rock Volumes: When checked, you will be prompted to select a third section (.SCT) file that will be used to calculate rock quantities.
Calculate Overexcavation: When checked, calculates volume of overexcavation. See diagram.



Report Cut/Fill Text: Specify whether or not to report cut/fill at each station.
Report Cut/Fill Differences: Adds a running total of the cut to fill balance at each station to the report.
Report Cumulative Cut/Fill: Adds a running total of the cut/fill at each station to the report.
Extend Shorter Sections to Longer: If checked, shorter sections are lengthened to the same left and right offset extents as the corresponding longer sections.
Interpolate Missing Section Stations: If checked, the missing stations are accounted for in the calculations.
Breakout Quantities by Staging: This option breaks out the cut and fill end areas and volumes according to user defined offsets along the road. The "Slope Format" determines how each stage will tie back into the road.



Slope Format
○ Ratio ○ Percent ● Vertical

Cut Slope 1.000 Fill Slope 1.000

	Stage Name	Left Side	Offset	Right Side	Offset
1	Leftside	Left Edge		Offset Right	0
2	Right1	Offset Left	0	Offset Right	10
3	Right2	Offset Right	10	Offset Right	20
4					
5					
6					
7					
8					
9					
10					
11					
12					

Last Stage Name Right SH

In the example above, volumes will be reported separately for the left side of the road, the inside right lane (offset 0-10), the outside right lane (offset 10-20), and then the remainder right side of the road will automatically be reported as the "Last Stage".

Topsoil Adjustment File: This optional input file applies topsoil removal and replacement for the calculations. See the Topsoil Removal/Replacement command for more details on the .TOP file.
Mass Diagram Output File: Specify an optional (.MAS) file for mass haul data output for the Draw Mass Diagram and Mass Diagram Report commands.
End-Area Output File: Specify an optional end-area (.EW) file for output that can be used in the Edit-Process End Area File command.

Prompts

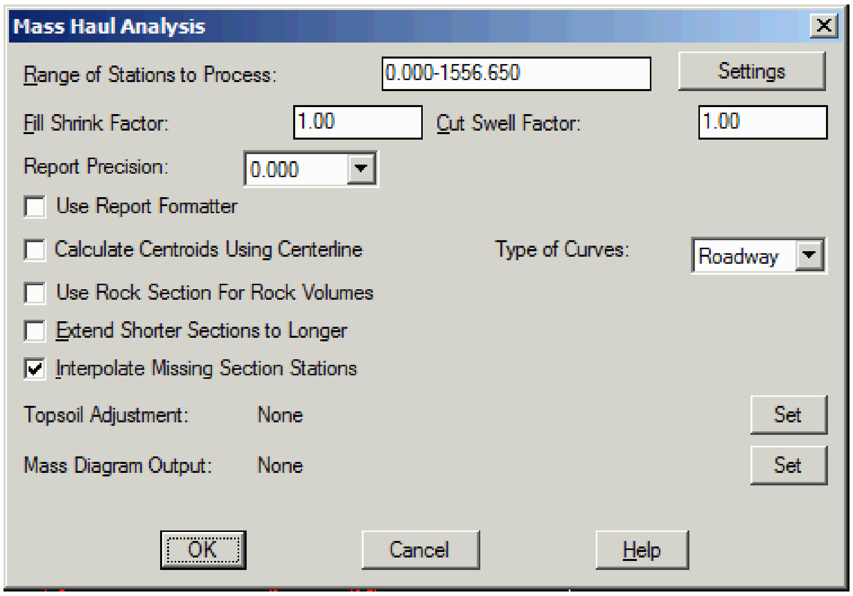
Section File (Existing Ground) to Read *choose existing .SCT file*
Section File (Final Ground) to Read *choose the other existing .SCT file*
Calculate Sections Volume dialog Make selections.

Pulldown Menu Location: Sections
Keyboard Command: calcsct
Prerequisite: Two section (.SCT) files

Mass Haul Analysis

This command will determine the volume and haul distance for each group of net cut and net fill station ranges along a road. The program calculates the optimized cut to fill movements so that the total volume-distance moved is minimized.

You will first be prompted to select the Existing Ground section file and the Design Surface section file or on End Area (.ew) file. These files will be used to determine the Mass Haul quantities. If you do not have either of these files, you can create them using the different Create Sections commands under Roads. After you selected your section (.sct) files or (.ew) file, the following dialog will appear.


Mass Haul Analysis

Range of Stations to Process: 0.000-1556.650

Fill Shrink Factor: 1.00

Cut Swell Factor: 1.00

Report Precision: 0.000

☐ Use Report Formatter

☐ Calculate Centroids Using Centerline

Type of Curves: Roadway

☐ Use Rock Section For Rock Volumes

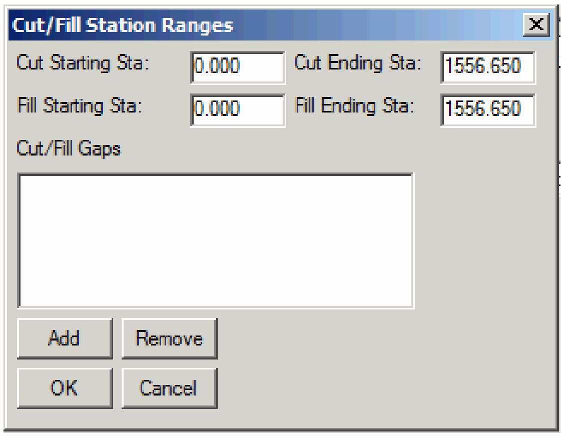
☐ Extend Shorter Sections to Longer

☑ Interpolate Missing Section Stations

Topsoil Adjustment: None

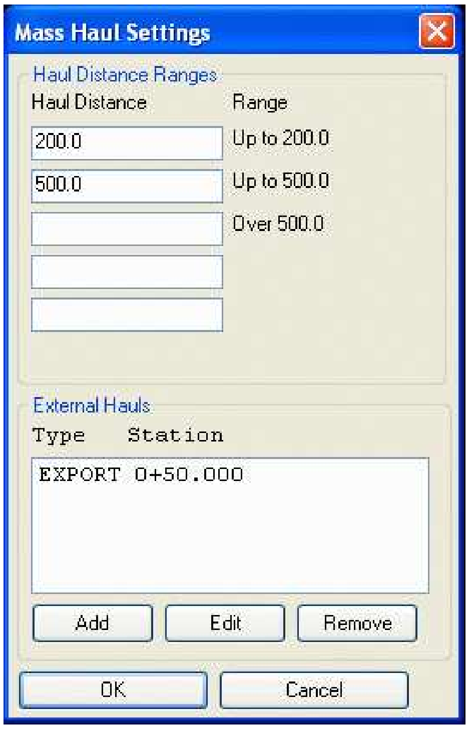
Mass Diagram Output: None

Range of Stations: The program will pick up the range of stations determined by your section files. In this field, you can modify the range of stations to process. The Settings button brings up another dialog with more station options:



Cut Starting Sta: 0.000 Cut Ending Sta: 1556.650
Fill Starting Sta: 0.000 Fill Ending Sta: 1556.650
Cut/Fill Gaps

Cut/Fill Starting/Ending Stations: The Cut and Fill Starting and Ending Stations are for tapering the end areas at the start and end of the section range down to zero beyond the station range.
Cut/Fill Gaps: Use the Add and Remove buttons to define a series of station ranges for cut/fill gaps where the program will not calculate any volumes.
Shrink/Swell Factors: The Shrink Factor is multiplied by the fill quantities and the Swell Factor is multiplied by the cut quantities.
Report Precision: This setting controls the number of decimal places to use in the report.
Use Report Formatter: The Report Formatter will allow you to customize the information reported by the Mass Haul Analysis.
Calculate Centroids Using Centerline: This option will find the center offset for each Cut/Fill area and use a centerline to adjust the station interval along curve segments for the end area volumes.
Use Rock Section For Rock Volumes: This option will use a third section file for reporting rock cut quantities.
Extend Shorter Sections to Longer: This option will find your longest section and match the length of all your other sections to it.
Interpolate Missing Section Stations: Toggle this on to interpolate any missing stations so that the Mass Haul report can use all the stations.
Topsoil Adjustment: This will apply a Topsoil Removal/Replacement definition from the Template Adjustments to adjust the sections.
Mass Diagram: This will create a Mass Diagram of the cut/fill balance by station. This data is stored in a profile file (.pro) format file, and you can use Draw Profile to draw it.



Haul Distance	Range
200.0	Up to 200.0
500.0	Up to 500.0
	Over 500.0

```
Type   Station
EXPORT 0+50.000
```

Mass Haul Settings

The Haul Distance ranges are for reporting the cut to fill volume movements by the different haul distance ranges. For each range of stations with a net cut volume, the report has a row for the net fill station range the cut was moved to, the amount of cut/fill, the volumes per haul distance range, the average haul distance per range and the overall haul distance average. The In Station Volume is the amount of cut and fill that occurred at the same station and doesn't have to be hauled to another station.

The purpose is to evaluate how far the cut has to be moved, and the haul distance ranges can be used to separate the distances for different types of equipment. The External Hauls can be used to specify the stations along the road for borrow pits or dump piles. The program will use volume from these external hauls when the cut/fill of the road does not balance.

Mass Haul Analysis

```
Existing Section> C:\Takeoff\Drawings\demo2-og.sct
Final Section> C:\Takeoff\Drawings\demo2-fn.sct
Volumes per Range Average Haul per Range
Net Cut Net Fill Total In Sta Haul 0 200 Over 0 200 Over
Station Station Cut(CY) Import Fill(CY) Export Volume Volume Volume 200 500 500 200 500 500 Overall Avg
0+00.000 1+00.000
1+00.000 2+50.000 1251.729 0.000 1251.729 0.000 1251.729 1127.595 124.134 124.134 0.000 0.000 153.135
0.000 0.000 153.135

12+00.000 10+50.000
13+80.000 12+00.000 887.367 0.000 887.367 0.000 887.367 239.938 647.429 542.651 104.777 0.000 164.552
209.534 0.000 179.887

13+70.000 15+05.340
13+90.000 15+23.200 95.633 0.000 95.633 0.000 95.633 51.559 44.074 44.074 0.000 0.000 137.235 0.000 0.000
137.235
```

13+80.000 14+20.000
14+20.000 14+50.000 216.434 0.000 216.434 0.000 216.434 96.872 119.563 119.563 0.000 0.000 38.560 0.000 0.000 38.560

14+60.000 14+50.000
14+80.000 14+60.000 43.333 0.000 43.333 0.000 43.333 18.620 24.712 24.712 0.000 0.000 11.818 0.000 0.000 11.818

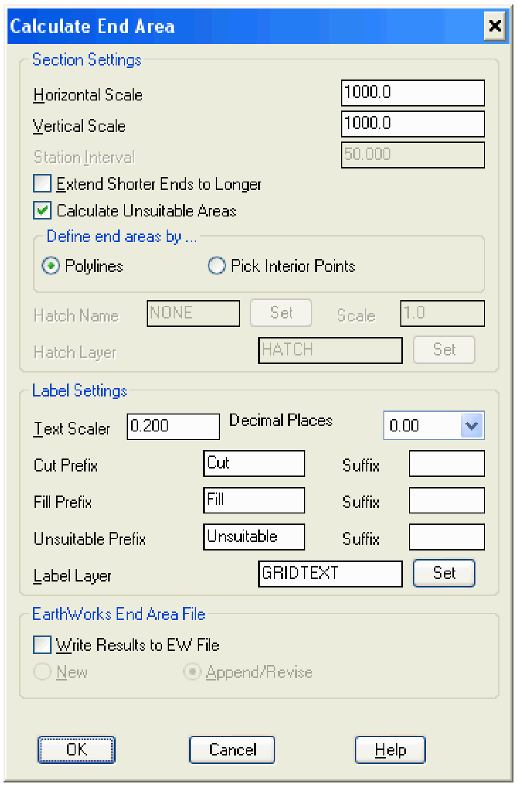
14+70.000 15+00.000
15+00.000 15+14.270 82.194 0.000 82.194 0.000 82.194 29.738 52.456 52.456 0.000 0.000 24.395 0.000 0.000 24.395

Total: 9808.744 0.000 69788.70 0.000 74189.76 66786.40 7403.360 1288.814 930.060 783.423 127.043 209.534 0.000 130.579

Pulldown Menu Location: Sections
Prerequisite: A Section Alignment File and Existing and Road Sections
Keyboard Command: masshaul

Calculate End Area

This command allows the user to select two polylines representing an existing grade section and a final grade section, and calculate the end area. Or you can also specify and define cut/fill end areas by picking interior points. The area calculated can be drawn at a user specified point. Optionally, the command writes the stations cut and fill to an earthwork (.EW) file that can be printed/displayed by the *Edit-Process End Area File* command. This command starts with the Calculate End Area dialog.



Calculate End Area

Section Settings
Horizontal Scale 1000.0
Vertical Scale 1000.0
Station Interval 50.000
☐ Extend Shorter Ends to Longer
☑ Calculate Unsuitable Areas
Define end areas by ...
● Polylines ○ Pick Interior Points
Hatch Name NONE Scale 1.0
Hatch Layer HATCH

Label Settings
Text Scaler 0.200 Decimal Places 0.00
Cut Prefix Cut Suffix
Fill Prefix Fill Suffix
Unsuitable Prefix Unsuitable Suffix
Label Layer GRIDTEXT

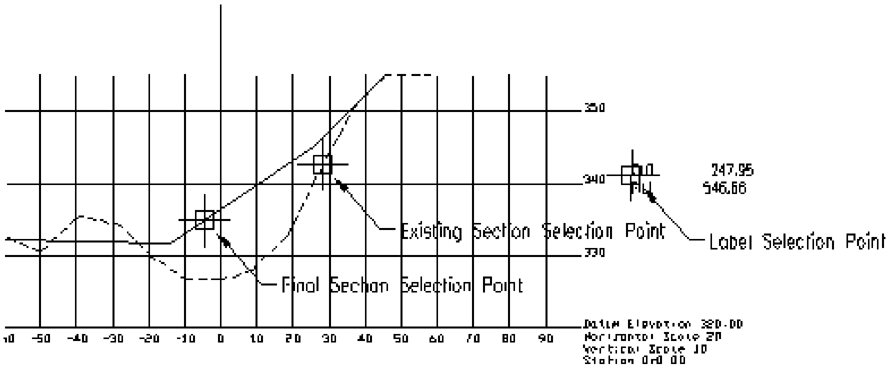
EarthWorks End Area File
☐ Write Results to EW File
○ New ● Append/Revise

Horizontal Scale: Specify the horizontal scale of the existing cross section.
Vertical Scale: Specify the vertical scale of the existing cross section.
Station Interval: Only available if *Write Results to EW File* is toggled on. Allows you to specify the station interval

that the station prompting will default to as you select the polyline/sections for computation.
Extend Shorter Ends to Longer: Click or leave blank.
Calculate Unsuitable Areas: When checked, the user will be prompted for polyline(s) or interior point(s) that represent unsuitable material. The areas and/or volumes for the unsuitable material is reported out separately from the overall cut and fill areas and/or volumes for overexcavation consideration.
Define end areas by chooses between picking two polylines or picking inside each end area.
Text Scale: Specify the text size scaler, this value is multiplied by the horizontal scale to determine the final text height.
Decimal Places: Controls the decimals for the cut/fill area labels.
Cut/Fill Prefix/Suffix: Specify prefix and suffix for the cut, fill, and unsuitable labels.
Label Layer: Specify the layer for the cut/fill area labels.
Write Results to EW File: When checked, the results will be written to an earthwork (.EW) file. You may create a new file or choose to append/revise an existing file.

Prompts

Calculate End Area dialog *make choices*
Specify Earthworks File (ew) dialog *specify new or existing file* This box appears if *Write Results to EW File* is clicked.
Select existing grade polyline (ENTER to end): *select polyline*
Select final grade polyline: *select polyline*
Calculating End Area...
Cut: 12002.965 Fill: 660.272
Pick Point for Label (Enter for none): *pick point*

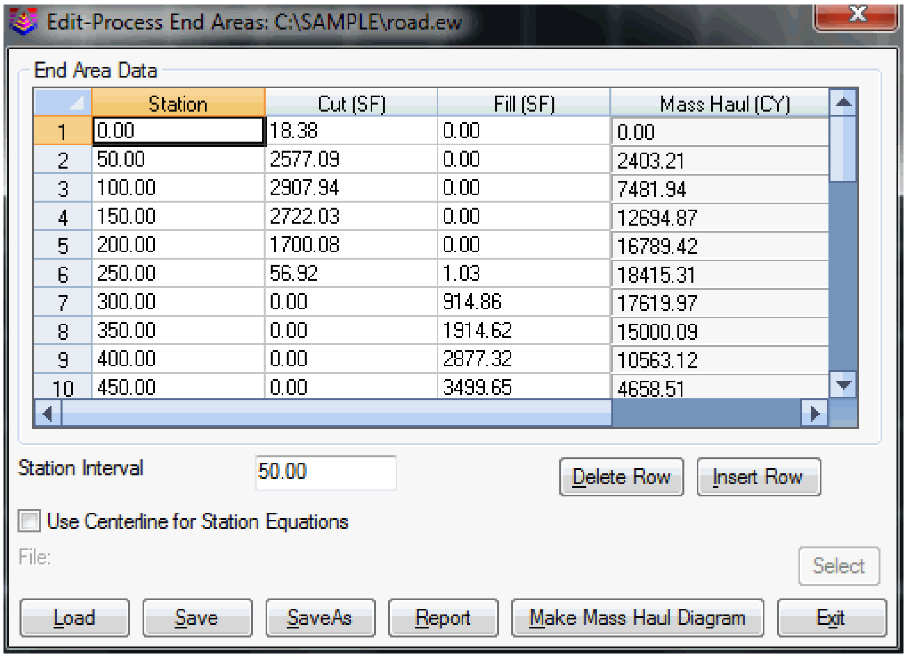


Enter the station <0.00> *press Enter* Pressing Enter selects the default station 0+00. If the station does not exist in the file it will be added. If it does it will be revised.
Select existing polyline: *press Enter*
Continue moving along automatically to the next station interval and select polylines. Or enter the station values randomly. The command sorts the .EW file regardless. As a result of this sort feature, the user can select stations in any order and they will be arranged in ascending order for proper volume computation.

Keyboard Command: endarea
Prerequisite: Plot the existing grade and final grade polyline/section

Edit Process End Area File

This command opens an End Area (.EW) file for editing and processing. Data can be entered directly into the spreadsheet. The Calculate Section Volumes command has an option to create an .EW file. The accumulative volume is displayed in the right side column of the spreadsheet. The Report function outputs a report of the stations, intervals, cut and fill. The Make Mass Haul Diagram function makes a .MAS file that can be used by the Draw Mass Diagram and Mass Diagram Report commands. The Use Centerline for Station Equations option applies to end area data with stations numbered using station equations. This option will use the station equations defined in a centerline file to remove the station equations from the end area stations for calculating the true distances for the volume calculations. You will be prompted to select the centerline file.



Edit-Process End Areas: C:\SAMPLE\road.ew

End Area Data

	Station	Cut (SF)	Fill (SF)	Mass Haul (CY)
1	0.00	18.38	0.00	0.00
2	50.00	2577.09	0.00	2403.21
3	100.00	2907.94	0.00	7481.94
4	150.00	2722.03	0.00	12694.87
5	200.00	1700.08	0.00	16789.42
6	250.00	56.92	1.03	18415.31
7	300.00	0.00	914.86	17619.97
8	350.00	0.00	1914.62	15000.09
9	400.00	0.00	2877.32	10563.12
10	450.00	0.00	3499.65	4658.51

Station Interval 50.00

☐ Use Centerline for Station Equations

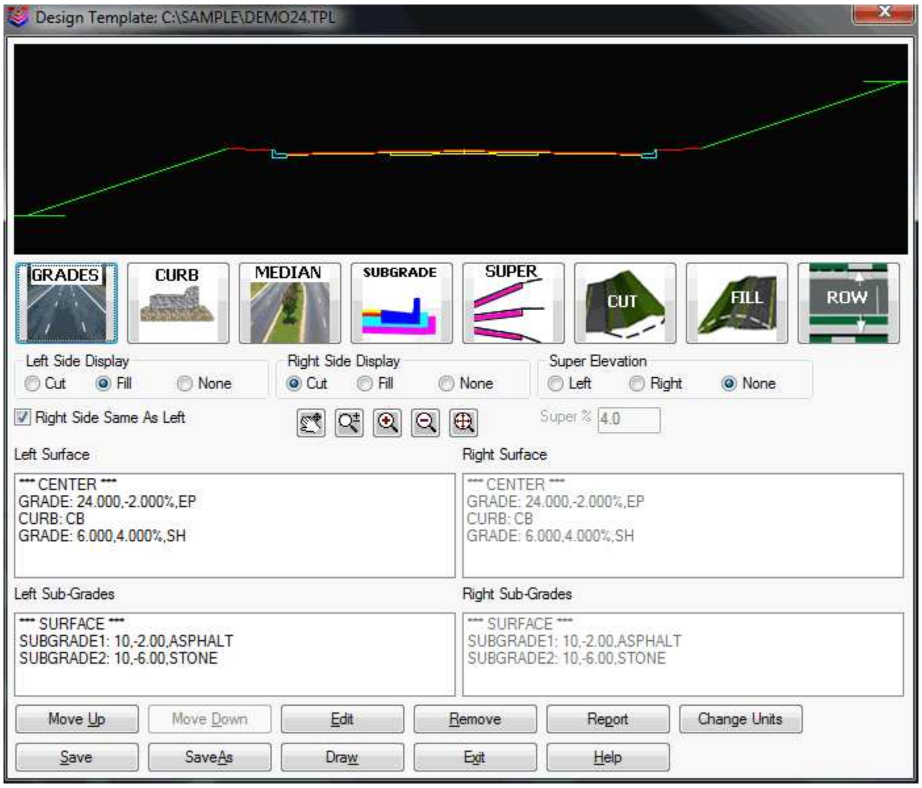
File:

Pulldown Menu Location: Sections
Keyboard Command: ewedit
Prerequisite: None

Design Template

This command creates a template definition file (.TPL file). The template file can then be applied in the *Process Road Design*, *Road Network, Draw Typical Template, Locate Template Points* or *Design Pad Template* commands. The template is designed using the dialog shown below. The top portion shows a graphic preview of the template as you create it. You can choose whether to show cut or fill slopes on the left and right sides. Also, you can choose whether to show the template in superelevation. In the middle is a row of icons which are the building blocks of the template. They can be chosen in any order by picking on the icon. In the bottom of the dialog are four list boxes that list the elements of the template. The surface elements are listed in order starting from the center. The subgrades are listed from top to bottom order. To add a template element, highlight the position in the list above where to insert the element. Then pick one of the element icons. To change the order of an element, highlight the element and pick the Move Up or Move Down buttons. The Edit button edits the dimensions of the highlighted element. The Remove button erases the highlighted element from the list. The Report button has two different report formats that include just the ID's of the template elements or all the dimensions of the template elements. The Change Units button allows you to apply a scale factor to the distances in the template which can be used to convert between English and Metric.

There is no limit to the number of surface or subgrade elements. Note that there is a Right Side Same as Left option. When active this option only requires template design for the left side and will automatically mirror the design for the right side.



Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ● Cut ○ Fill ○ None

Super Elevation: ○ Left ○ Right ● None

☑ Right Side Same As Left

Super % 4.0

Left Surface

```
*** CENTER ***
GRADE: 24.000,-2.000%,EP
CURB: CB
GRADE: 6.000,4.000%,SH
```

Right Surface

```
*** CENTER ***
GRADE: 24.000,-2.000%,EP
CURB: CB
GRADE: 6.000,4.000%,SH
```

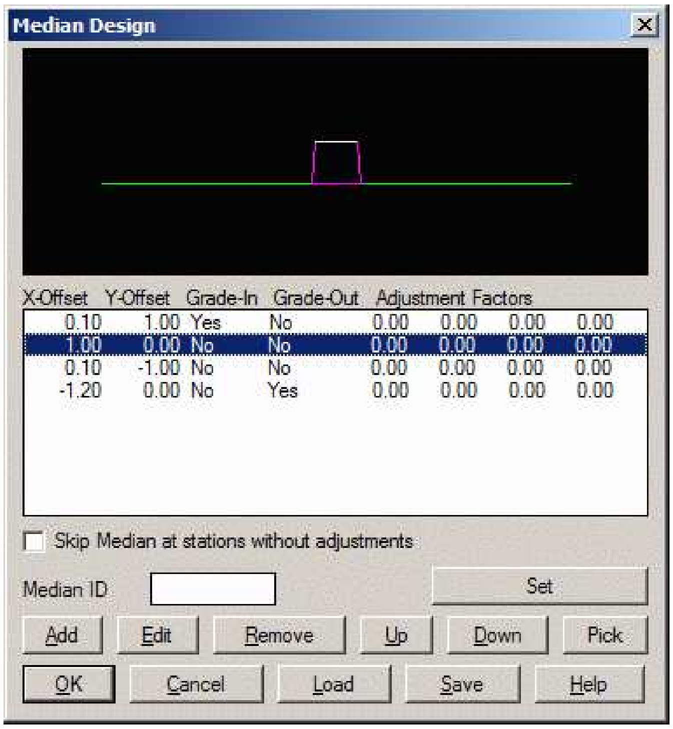
Left Sub-Grades

```
*** SURFACE ***
SUBGRADE1: 10,-2.00,ASPHALT
SUBGRADE2: 10,-6.00,STONE
```

Right Sub-Grades

```
*** SURFACE ***
SUBGRADE1: 10,-2.00,ASPHALT
SUBGRADE2: 10,-6.00,STONE
```

The template surface can be composed of three types of elements: medians, grades and curbs. The median is a flexible closed figure defined in a clockwise direction. Each median point consists of an X and Y offset. The median must be closed and the program will automatically create the closing segment. In the Median Design dialog, the median is shown in the top display and bottom has a list of median points. The display shows the median in magenta and the grade lines in and out in green. For the display the grade in comes from the left and the grade out goes to the right. The median must define the Grade In point which is the point that ties into the incoming surface grade. Also the Grade Out point must be specified for where the surface grade continues out from the median. These Grade In and Grade Out points emanate from the starting or "from" position in the coordinate dialog where they are specified. Since a single median must be placed on the left or right side (and is typically not used symmetrically with right side same as left), you will need to offset the template centerline one-half the median width within the command Process Road Design in order to center the median. You will also have to move the "C/L" designation, to obtain centering, when using Draw Typical Template.



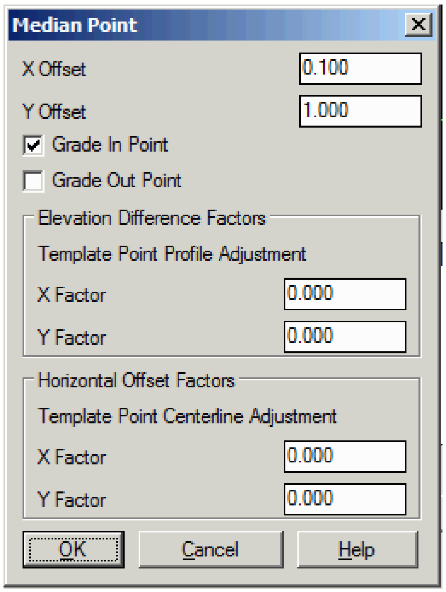
X-Offset	Y-Offset	Grade-In	Grade-Out	Adjustment Factors			
0.10	1.00	Yes	No	0.00	0.00	0.00	0.00
1.00	0.00	No	No	0.00	0.00	0.00	0.00
0.10	-1.00	No	No	0.00	0.00	0.00	0.00
-1.20	0.00	No	Yes	0.00	0.00	0.00	0.00

☐ Skip Median at stations without adjustments

Median ID

Using the Load and Save buttons, medians can be saved and loaded with .MDN files for sharing and re-use in other templates. The Up and Down buttons change the order of the highlighted X/Y Offset record in the list. The Pick button prompts to pick a closed polyline from the drawing to define the median geometry. The Set button shows a list of grade ID's from the current Template ID Library. The Skip Median option creates the median only in the station range of Template Point Profile or Template Point Centerline transitions.

To enter the dimensions of the median, use the Add or Edit button. The adjustment factors control how to apply Template Point Profile and Template Point Centerline adjustments. For Template Point Profiles, the program figures the amount of vertical adjustment between the transition profile and the normal profile. The amount of this vertical adjustment is multiplied by the adjustment factor and then added to the X/Y Offsets of the median point. Likewise, the program figures the horizontal adjustment between the transition centerline and normal centerline for Template Point Centerlines and applies this adjustment by the factors to the offsets. These adjustment factors allow for dynamic medians. For example, the height of a retaining wall could be controlled using a Template Point Profile and the median points for the vertical sides would have a Y Factor set to 1 to pick up the full vertical adjustment and the median points for the top and bottom edges would have a Y Factor of 0 keep those edges the same.


Median Point
OK
Cancel
Help

X Offset: 0.100

Y Offset: 1.000

☑ Grade In Point

☐ Grade Out Point

Elevation Difference Factors

Template Point Profile Adjustment

X Factor: 0.000

Y Factor: 0.000

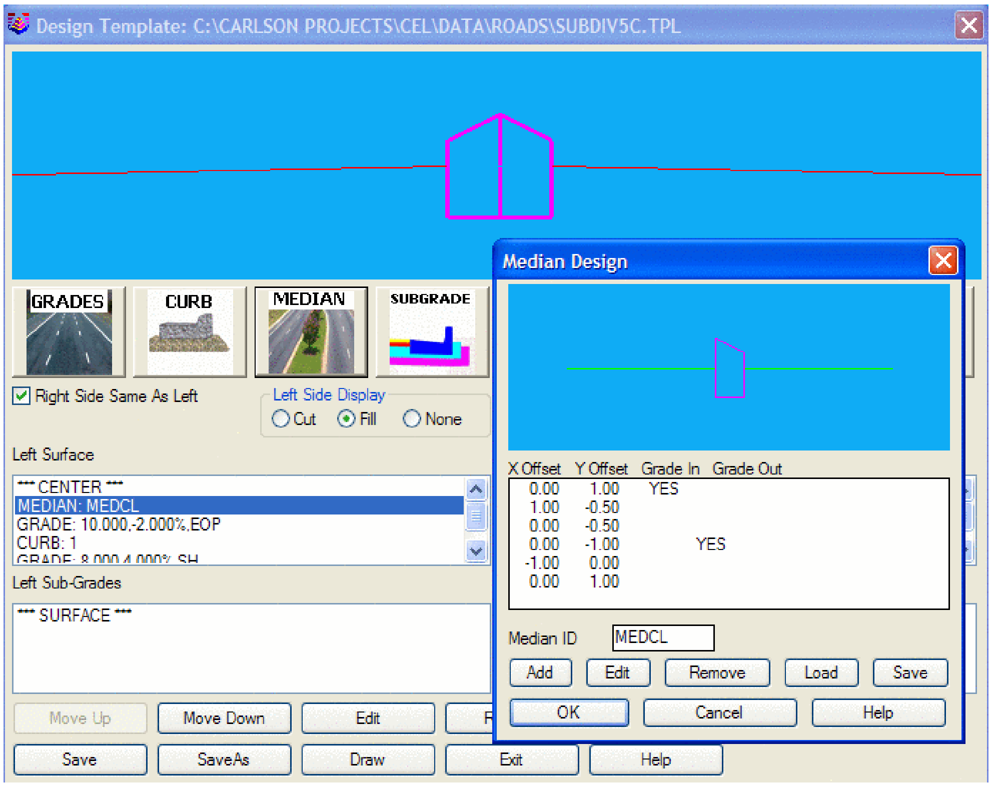
Horizontal Offset Factors

Template Point Centerline Adjustment

X Factor: 0.000

Y Factor: 0.000

You can design a median for "mirroring" to create a centered effect, as shown below. The only negative to this method is the appearance of a vertical line in the median plot.


Design Template: C:\CARLSON PROJECTS\CEL\DATA\ROADS\SUBDIV5C.TPL
GRADES
CURB
MEDIAN
SUBGRADE
Move Up
Move Down
Edit
Save
SaveAs
Draw
Exit
Help
Median Design
Add
Edit
Remove
Load
Save
OK
Cancel
Help

☑ Right Side Same As Left

Left Side Display: ○ Cut ● Fill ○ None

Left Surface

```
*** CENTER ***
MEDIAN: MEDCL
GRADE: 10.000,-2.000%,EOP
CURB: 1
GRADE: 8.000,4.000%,SH
```

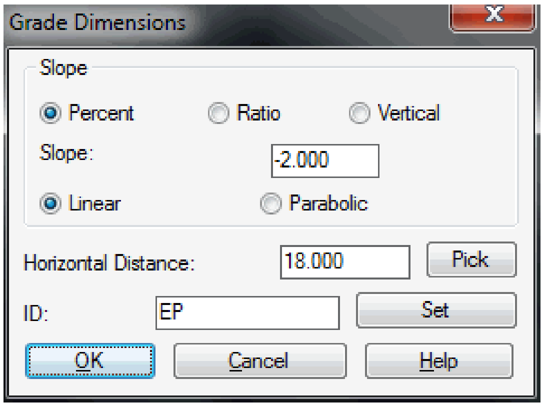
Left Sub-Grades

```
*** SURFACE ***
```

X Offset	Y Offset	Grade In	Grade Out
0.00	1.00	YES	
1.00	-0.50		
0.00	-0.50		
0.00	-1.00		YES
-1.00	0.00		
0.00	1.00		

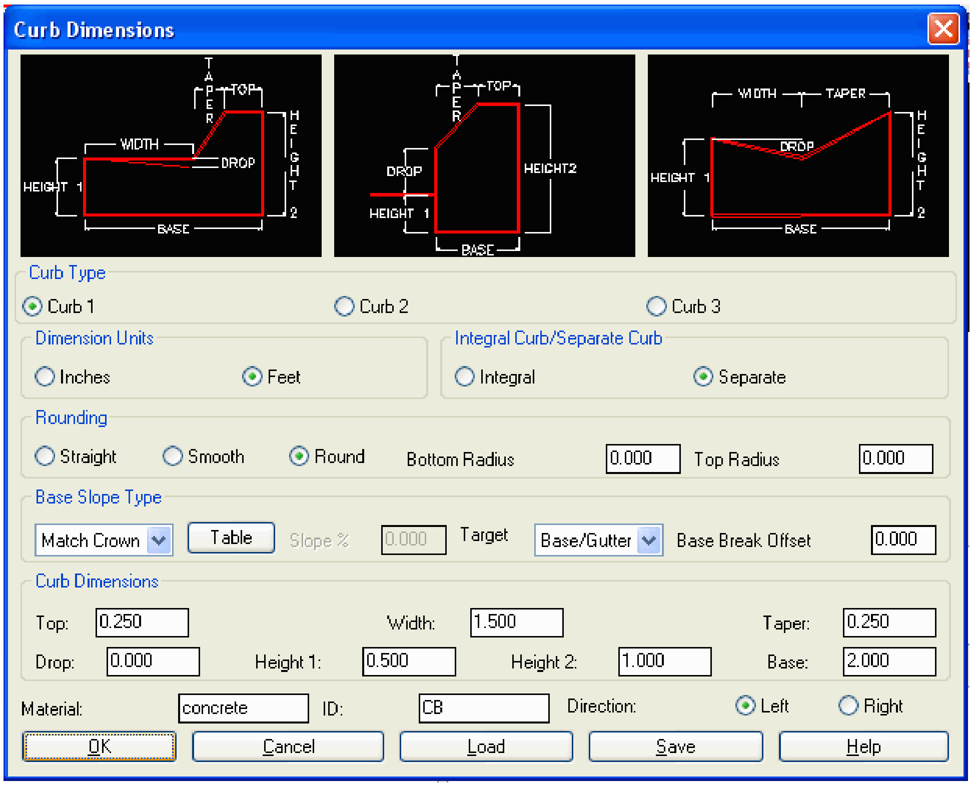
Median ID: MEDCL

Surface grades can be entered by selecting the Grades icon which brings up the dialog shown. Downhill slopes are negative and the Distance is the horizontal distance. The slope can be specified in either Percent, Ratio or Vertical format. The Vertical format is the actual elevation difference. The slope type can be either Liner or Parabolic. The Linear is a constant slope and the Parabolic gets steeper across the grade until it reaches the full specified slope at the end of the grade. The text ID serves 4 purposes: (1) The ID will be applied as a description to all final template points generated in the form of a coordinate (.CRD) file, (2) The ID can be used as a design point, as in EP+5 indicating 5 feet or meters right of edge of pavement, (3) Points of common ID may be connected by 3D polylines as an output option of *Process Road Design* and (4) Quantities can be generated with reference to the ID and material (gravel, concrete, etc.) entered elsewhere within this command. The Pick button prompts to select a linework segment or two points from the drawing to define the grade slope and distance. The Set button shows a list of grade ID's from the current Template ID Library.



Slope
● Percent ○ Ratio ○ Vertical
Slope: -2.000
● Linear ○ Parabolic
Horizontal Distance: 18.000
ID: EP

To add a curb, select the Curb icon. The dialog box below appears where you can fill in the curb dimensions. There are three curb types to choose from. The curb dimensions can be specified in feet, inches or meters in metric mode. The Smooth option will smooth the surface of the curb which only shows when the template is applied in commands such as *Process Road Design*. The Round option will fillet a curve at the bottom and top of the taper using the specified Bottom and Top Radius. The Integral/Separate option determines whether to draw the front line of the curb to separate the curb from the subgrade. For example, fully concrete pavements that contain a curb would be drawn with the "integral" curb option. The Base Slope Type of the curb can either be flat, set to the slope of the incoming grade or set to a user-specified slope. For the Match Crown method, you can use the Table option to define a lookup table of different curb slopes for different crown grades. For cases with part of the curb at a slope and part flat, you can use the Base Break Offset to set the transition position between sloped and flat. The Target setting for the slope controls which parts of the curb are sloped. The Material name is used in the *Process Road Design* report. The ID is a unique identifier for this element of the template and is used for referencing the curb in other routines. The Direction controls which way the curb faces. This Direction option is needed for divided roads that have curbs facing both ways on either side of the road.



Curb Type
● Curb 1 ○ Curb 2 ○ Curb 3

Dimension Units
○ Inches ● Feet

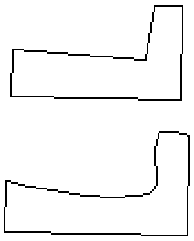
Integral Curb/Separate Curb
○ Integral ● Separate

Rounding
○ Straight ○ Smooth ● Round
Bottom Radius 0.000
Top Radius 0.000

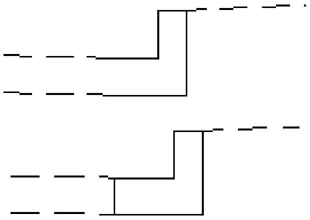
Base Slope Type
Match Crown
Slope % 0.000
Target Base/Gutter
Base Break Offset 0.000

Curb Dimensions
Top: 0.250
Width: 1.500
Taper: 0.250
Drop: 0.000
Height 1: 0.500
Height 2: 1.000
Base: 2.000

Material: concrete
ID: CB
Direction: ● Left ○ Right

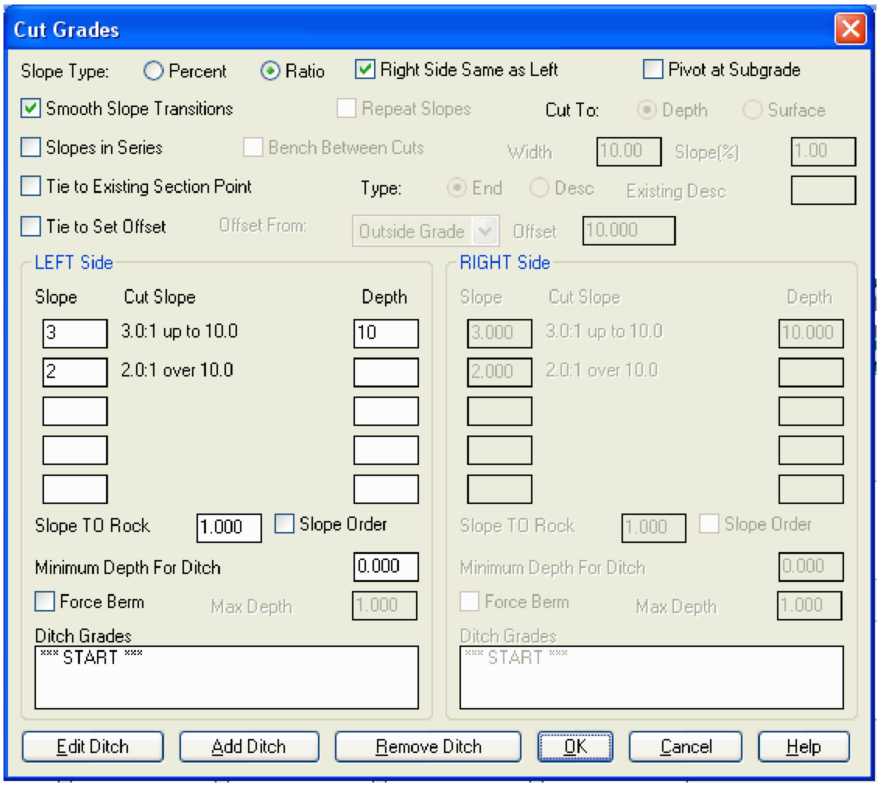


Straight & rounded curbs



Integral and separate curbs

To specify cut treatment, pick the Cut icon. There is room to specify up to five cut slopes which can be slopes in series or slopes to use at different depths. In a simple case of one cut slope, you can just enter the one slope value and leave the depth and other slope boxes blank. For Slopes in Series, each slope is used up to the specified depth until an intersection with the ground. If the intersection is not reached by the first slope, then the next slope continues from where the first ended. If you have more than five slopes, pick the Repeat Slopes option which will repeat the sequence of entered slopes until the ground is reached. The Bench Between Cuts option allows you to enter a bench width and percent slope to be inserted between each cut slope. Besides running the cut slopes to specific depths, the Cut To Section option can be used to have each cut slope intersect a surface from a section (.sct) file. With Cut To Section on, the Process Road Design command will prompt for these cut slope section files. For example, this Cut To Section option could be used when you have a cut bench that occurs at a set elevation but different cut depths as the road profile changes. In this case, you could create a section (.sct) file at this set bench elevation.



Cut Grades

Slope Type: ○ Percent ● Ratio ☑ Right Side Same as Left ☐ Pivot at Subgrade

☑ Smooth Slope Transitions ☐ Repeat Slopes Cut To: ● Depth ○ Surface

☐ Slopes in Series ☐ Bench Between Cuts Width 10.00 Slope(%) 1.00

☐ Tie to Existing Section Point Type: ● End ○ Desc Existing Desc

☐ Tie to Set Offset Offset From: Outside Grade Offset 10.000

LEFT Side

Slope	Cut Slope	Depth
3	3.0:1 up to 10.0	10
2	2.0:1 over 10.0	

Slope TO Rock 1.000 ☐ Slope Order

Minimum Depth For Ditch 0.000

☐ Force Berm Max Depth 1.000

Ditch Grades

*** START ***

RIGHT Side

Slope	Cut Slope	Depth
3.000	3.0:1 up to 10.0	10.000
2.000	2.0:1 over 10.0	

Slope TO Rock 1.000 ☐ Slope Order

Minimum Depth For Ditch 0.000

☐ Force Berm Max Depth 1.000

Ditch Grades

*** START ***

The Pick buttons prompts to select a linework segment or two points from the drawing to define the cut slope.

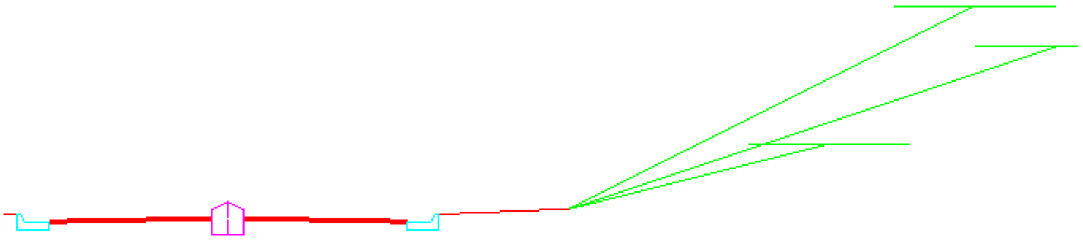
The Tie to Set Offset forces the cut slope catch point to a specified fixed offset. This offset can be relative to the centerline or the template pivot point. This tie method can be used when you want the cut slope to always tie into existing at a fixed ROW offset.

The Force Fill option will make the template attempt to find a catch point with a fill slope even when the pivot point is in cut. You can specify the fill slope to use and the maximum depth for the fill slope.

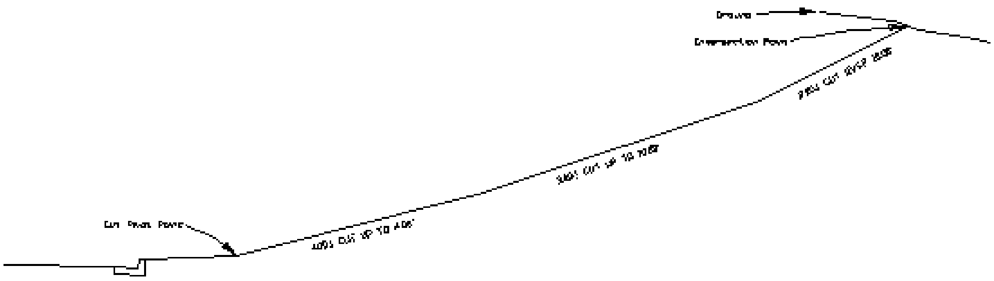
The Tie ID sets the description to use in the design section file for the tie point. This is the same setting as under the Fill Grades dialog.

The Load Ditch and Save Ditch functions allow you to save and recall ditch grades to a .DIT file. This way to can make your own library of ditch definitions.

With Slopes in Series off, just one of the slopes is used depending on the depth. For example, set the dialog as shown to use 4 to 1 slopes at depths up to 4 feet, 3:1 up to 10 and 2:1 if deeper. The effect is 4:1 if shallow and, by contrast, 2:1 if the fill is deep. The Smooth Transitions option will gradually transition the slopes from one range to the next. In this example, if the depth is 5 feet the slope will be between 4:1 and 3:1. The graphic in the Design Template dialog will explicitly show slopes in series versus individual slope depending on setting (shown below are individual slopes, with slopes in series off):



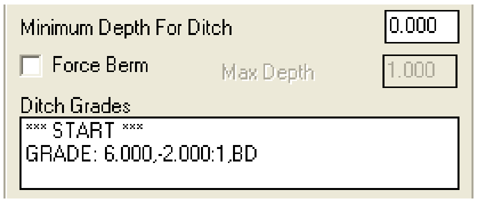
The Pivot at Subgrade option will position the cut pivot point where the bottom subgrade intersects the template grade. The ditch or upslope conditions will then occur from this special subgrade "daylight" pivot point, instead of from the outer shoulder surface pivot point. The Tie to Existing Point will draw the cut slope from the cut pivot point to either the outside offset-elevation or an offset-elevation point with a specified description from the existing section file. This method is used when survey crews take sections and designate the specific slope tie points.



Three cut slopes in series

The Slope to Rock applies in Process Road Design when using a Rock Section File. There are two slope order modes for rock slopes: Slope TO Rock and Slope FROM Rock. For the Slope TO Rock mode, the cut slope will be the Slope To Rock up to the rock surface. After reaching the rock surface, the regular cut slopes apply. For the Slope FROM Rock mode, the regular cut slopes apply up to the rock surface. Then from the Slope From Rock applies from the rock surface to the ground surface.

Ditch Grades can be inserted prior to the application of the cut upslope. For curb and gutter roads, there is typically no ditch. But for roads with drainage downhill to the outside and no curbs, ditches are typically used in cut conditions. The Ditch Grades list contains each ditch grade in order from the regular template. Any number of ditch grades can be added by picking the Add Ditch button. To create a V ditch, add just one ditch grade such as slope ratio -1, distance 1. This makes one side of the V. The pivot point for the cut slopes will be the bottom of the V and the other side of the V will be made by the cut upslopes. For a ditch with a flat bottom, you could have two ditch grades such as slope ratio -2, distance 4 and then slope percent 0, distance 2. If a minimum depth for ditch is entered, no ditch will be applied unless the cut exceeds that depth. The Force Berm will apply the Berm (defined using the Fill icon) in cut instead of a ditch up to a certain depth of cut.

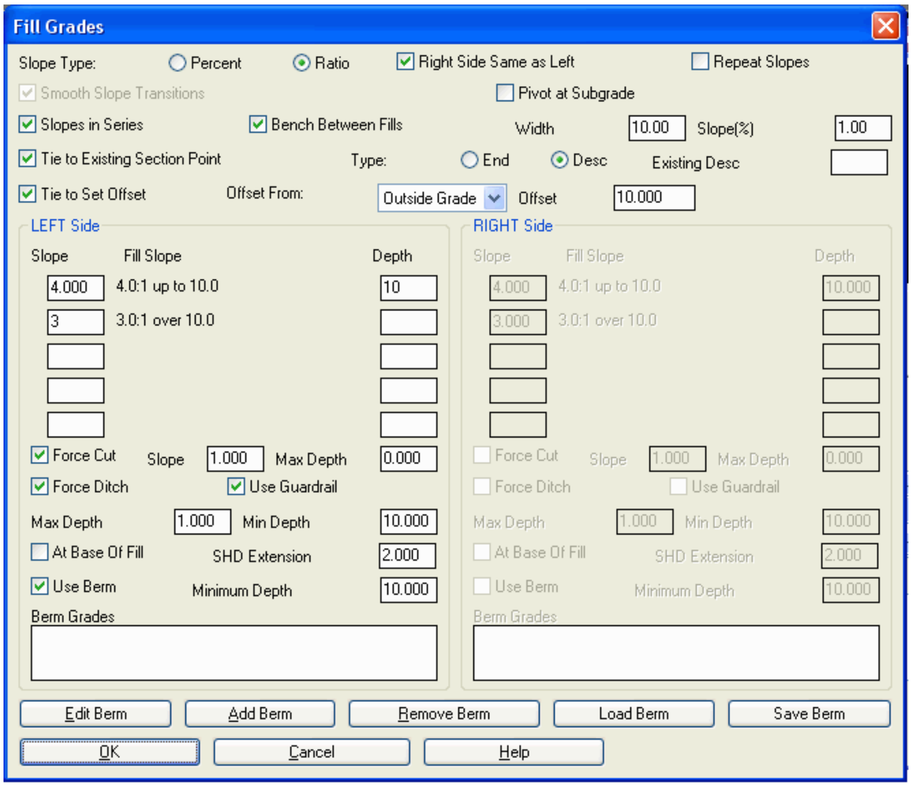


Minimum Depth For Ditch 0.000

☐ Force Berm Max Depth 1.000

Ditch Grades

```
*** START ***
GRADE: 6.000,-2.000:1,BD
```



Slope Type: ○ Percent ● Ratio ☑ Right Side Same as Left ☐ Repeat Slopes

☑ Smooth Slope Transitions ☐ Pivot at Subgrade

☑ Slopes in Series ☑ Bench Between Fills Width 10.00 Slope(%) 1.00

☑ Tie to Existing Section Point Type: ○ End ● Desc Existing Desc

☑ Tie to Set Offset Offset From: Outside Grade Offset 10.000

LEFT Side

Slope	Fill Slope	Depth
4.000	4.0:1 up to 10.0	10
3	3.0:1 over 10.0	

☑ Force Cut Slope 1.000 Max Depth 0.000

☑ Force Ditch ☑ Use Guardrail

Max Depth 1.000 Min Depth 10.000

☐ At Base Of Fill SHD Extension 2.000

☑ Use Berm Minimum Depth 10.000

Berm Grades

RIGHT Side

Slope	Fill Slope	Depth
4.000	4.0:1 up to 10.0	10.000
3.000	3.0:1 over 10.0	

☐ Force Cut Slope 1.000 Max Depth 0.000

☐ Force Ditch ☐ Use Guardrail

Max Depth 1.000 Min Depth 10.000

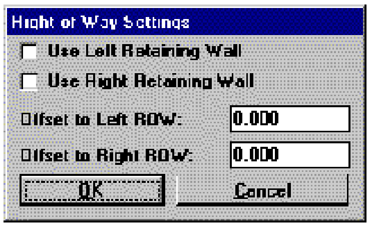
☐ At Base Of Fill SHD Extension 2.000

☐ Use Berm Minimum Depth 10.000

Berm Grades

Fill treatment is similar to cut. Up to five slopes for different depths can be specified. Slopes in Series and Smooth Transitions work the same way as cut. Berm Grades are the fill equivalent to Ditch Grades. Fill treatment does have some extra options. Guardrail Expansion will extend the last template surface grade the specified Shoulder Distance when the fill is greater than the Min Depth. The Force Ditch option has two different methods to apply the Ditch Grades from the cut definition. With "At Base Of Fill" on, Force Ditch creates the ditch where the fill slope hits existing ground. With "At Base of Fill" off, the Force Ditch method applies the ditch grades from the template pivot point. The Minimum Depth for Berm Grades will only draw the Berm Grades when the fill depth is greater than the specified value. The Force Cut option will make the template attempt to find a catch point with a cut slope even when the pivot point is in fill. You can specify the cut slope to use and the maximum depth for the cut slope.

The Right of Way icon brings up the dialog shown which allows you to specify whether to use a retaining wall to keep the cut/fill slopes from crossing the right of way. The right of way data is stored in a centerline file (.cl file) as stations and offsets for the left and right sides of a centerline. When the retaining wall option is active, the cut or fill slope will go at the design slope up to the right of way and then the slope will tie into the ground by going straight up or down. Without the retaining wall option, the cut or fill slope will become steeper in order to tie into the ground at the right of way. For example, if the cut slope is 50% but this slope ties into the ground past the right of way, then the slope will be modified to something steeper such as 65%. The Offset ROW options will force the tie in the offset distance before the right of way.



Right of Way Settings

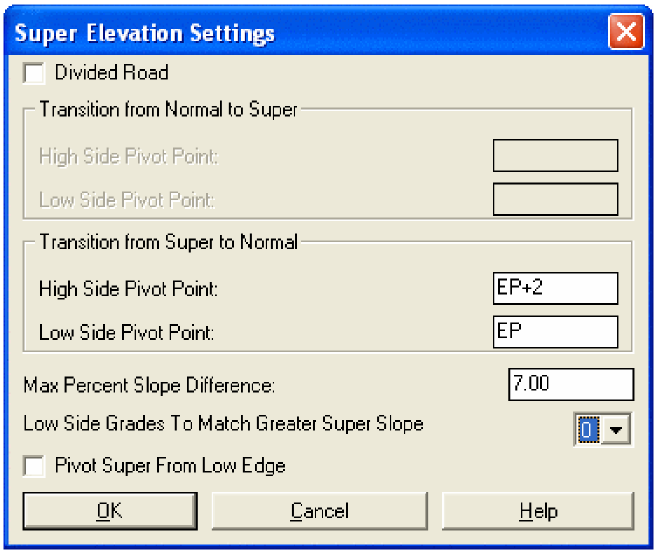
☐ Use Left Retaining Wall

☐ Use Right Retaining Wall

Offset to Left ROW: 0.000

Offset to Right ROW: 0.000

The Shoulder Super Elevation icon specifies where on the template the slopes will transition between super elevation slopes and normal slopes. The transition point is identified under Pivot Point by the template id for the grade, curb or median. Note that the pivot point can be specified as an ID plus a distance as in "EP+2". Starting from the center, the template grades will be in super up through this template segment. For example, based on the template shown in the first dialog of this command, the EOP Pivot Point the Super Elevation Settings dialog will create the first EOP grade in super while the curb and grade S will be at normal grade. The High and Low Pivot Point options allow for different transition points depending on which side is raised by the super elevation. The Max Percent Slope Difference is the maximum difference between the super elevation grade and the normal grade at the pivot point. For example with a Max Percent Slope Difference of 7%, if the super elevation grade is 6%, then the slope after the pivot on the high side will be -1% even if the normal design slope is steeper than -1%. If the grades do not start from the center in super, then the Divided Roads option can be used. With this option, the grades start from the center as normal and then transition to super at the Normal to Super Pivot Point.



Super Elevation Settings

☐ Divided Road

Transition from Normal to Super

High Side Pivot Point:

Low Side Pivot Point:

Transition from Super to Normal

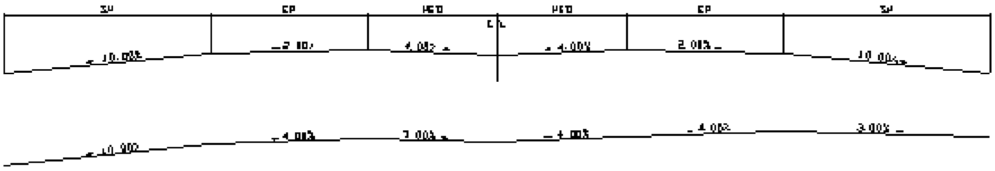
High Side Pivot Point: EP+2

Low Side Pivot Point: EP

Max Percent Slope Difference: 7.00

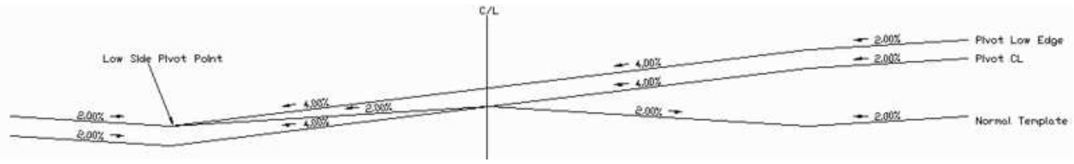
Low Side Grades To Match Greater Super Slope: 0

☐ Pivot Super From Low Edge

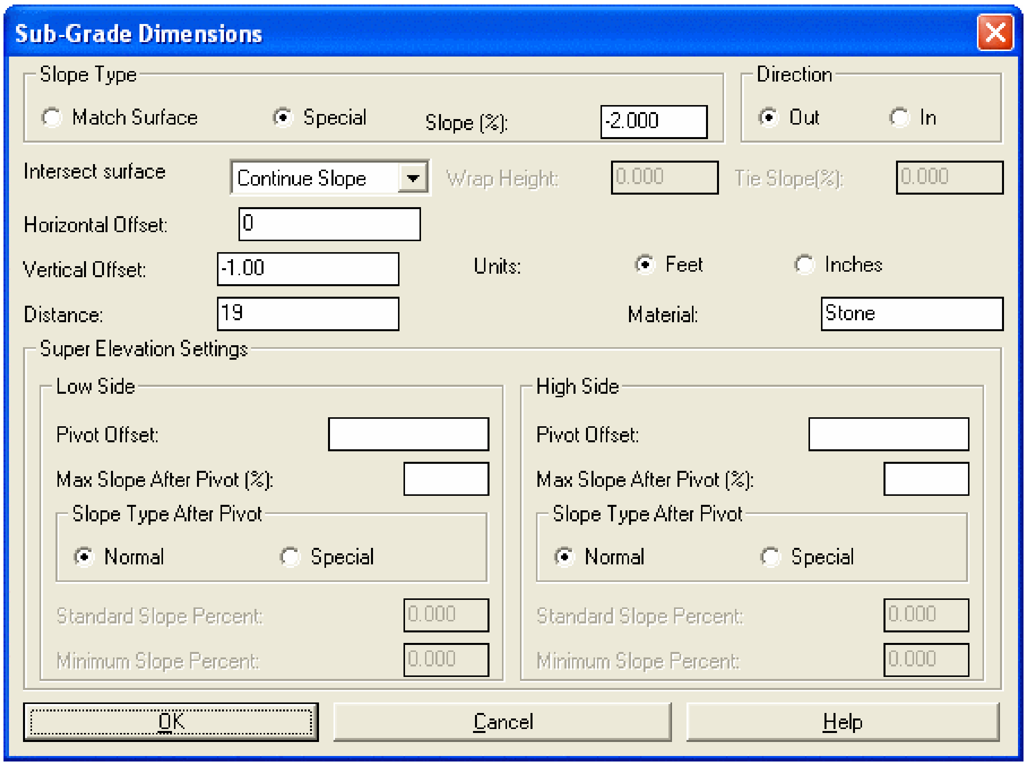


Here is an example of super elevation of 4% to the right for a divided road with a Max Difference of 7%. The normal template is shown above. The Normal to Super Pivot Point is MED and the Super to Normal Pivot Point is EP. The result is that the EP segment is in super and the SH and MED segments are at normal slope. On the left, the SH segment is at the normal -10%, the EP segment is at the super elevation slope of -4% and the MED segment wants to be at 4% but ends up at 3% because this meets the Max Difference requirement. On the right side, the MED segment starts at the normal -4%, then the EP segment transitions into the super -4% and then the SH transitions back to normal which results in a 3% slope because of the Max Difference requirement.

The Low Side Grades To Match Greater Super Slope option applies to the template grades that are outside the super pivot. When the super slope becomes steeper than these outside grades, then these grades are adjusted to match the same super slope. You can set up to two grades past the super pivot to adjust. For example, consider a template where the super pivot is the EP grade and the next grade is a SHD for the shoulder. If the SHD normal slope is -4%, then the SHD will stay at -4% through the super transition until the super becomes greater that -4%. So when the super is at -6%, the SHD will also be at -6%.



The Pivot Super From Low Edge holds the normal crown grade of the low side edge of super and raises the rest of the template to match the super slopes. Otherwise the profile grade at the centerline is held.


Sub-Grade Dimensions

Slope Type: ○ Match Surface ● Special Slope (%): -2.000

Direction: ● Out ○ In

Intersect surface: Continue Slope

Wrap Height: 0.000 Tie Slope(%): 0.000

Horizontal Offset: 0

Vertical Offset: -1.00

Units: ● Feet ○ Inches

Distance: 19

Material: Stone

Super Elevation Settings

Low Side

Pivot Offset:

Max Slope After Pivot (%):

Slope Type After Pivot: ● Normal ○ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

High Side

Pivot Offset:

Max Slope After Pivot (%):

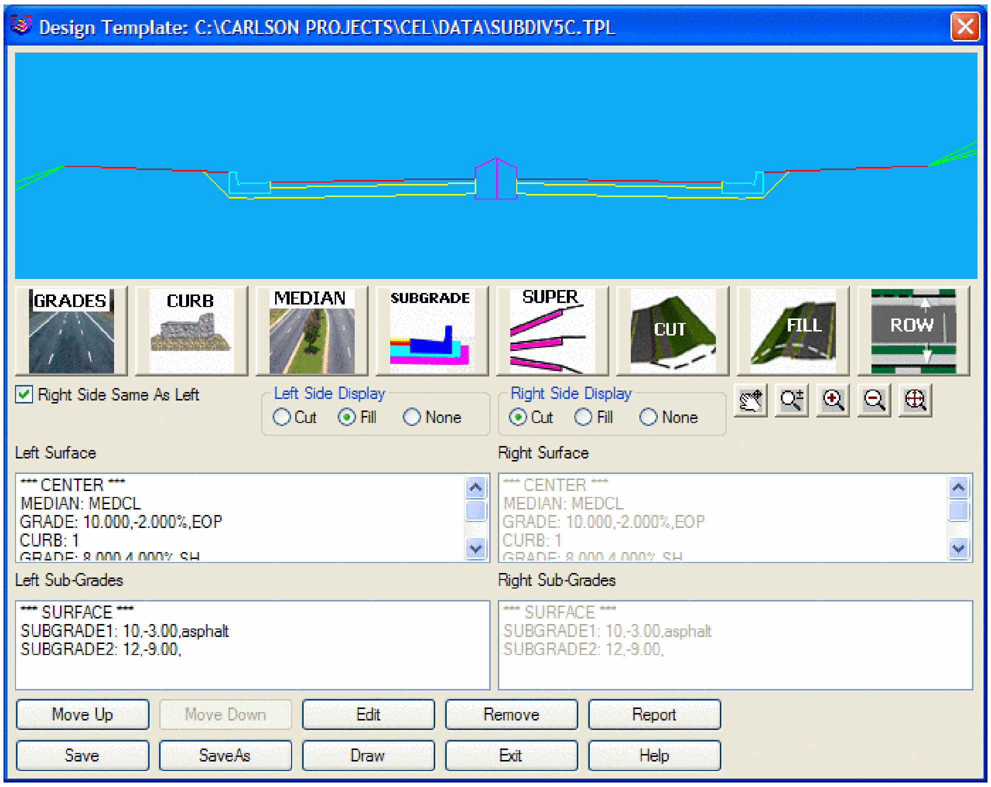
Slope Type After Pivot: ● Normal ○ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

To add subgrades click the SubGrades icon which brings up the dialog shown. The subgrades are areas below the template surface. There can be any number of subgrades stacked one below another or side by side.

The subgrade starts from the surface at the distance from the center set under Horizontal Offset. To start from the centerline, enter 0 in Horizontal Offset. First the subgrade moves straight down from this Horizontal Offset. The depth down is specified in Vertical Offset in feet units or meters in metric mode. The Vertical Offset normally should be set as a negative number. The bottom of the subgrade then either moves away from or towards the center depending in the Direction In or Out setting. The distance to move is specified under Distance. The Slope Type for the subgrade bottom can be either set to a specified slope or set to match the grades of the surface. After moving the specified distance, the subgrade will tie back into the template surface either by going straight up, by continuing at the subgrade slope until intersecting the surface or by wrapping around. The commonly used "continue slope" approach will extend the slope until it hits something (like a curb or another surface segment). It will not trim. So if the pavement segment is 12 feet to a curb, it is better to enter 10 and "continue slope" than to enter 12 exactly, as a "tilted" curb may place the curb edge at 11.98' from the start of the subgrade, causing the subgrade to go past face of curb and intersect back of curb. Also, for angled tie-ins of subgrade from base of curb to the surface, such as the example shown below, be sure the distance entered is less than what would intersect the surface, so that the "extend" effect will create the intersect. In this example, the first subgrade (asphalt) is "continue slope", the second (gravel) is "straight up" and the third (gravel tie in behind curb) is "continue slope".



Design Template: C:\CARLSON PROJECTS\CEL\DATA\SUBDIV5C.TPL

☑ Right Side Same As Left

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ● Cut ○ Fill ○ None

Left Surface

*** CENTER ***
MEDIAN: MEDCL
GRADE: 10.000,-2.000%,EOP
CURB: 1
GRADE: 8.000,4.000%,SH

Right Surface

*** CENTER ***
MEDIAN: MEDCL
GRADE: 10.000,-2.000%,EOP
CURB: 1
GRADE: 8.000,4.000%,SH

Left Sub-Grades

*** SURFACE ***
SUBGRADE1: 10,-3.00,asphalt
SUBGRADE2: 12,-9.00,

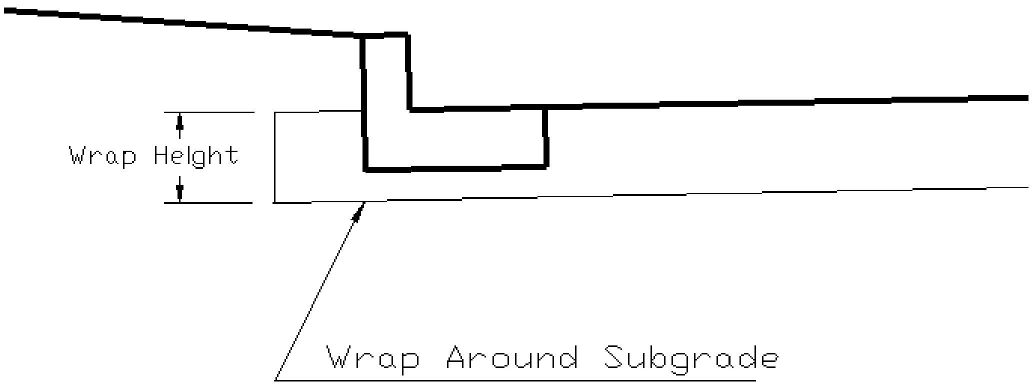
Right Sub-Grades

*** SURFACE ***
SUBGRADE1: 10,-3.00,asphalt
SUBGRADE2: 12,-9.00,

The Material field is an optional description that is used in the *Process Road Design* report.

Special super elevation pivot points may optionally be specified. The Pivot Offset allows the subgrade slope to break in super elevation independently of where the surface grade breaks. The subgrade will follow the super elevation slope from the centerline to the Pivot Offset. Then after the Pivot Offset, there are options to set the slope. The Min and Max Slope settings restrict the subgrade slope. The Normal option sets the slope the same as the non-super elevation state. The Special option can be used to set the slope to a specific value.

The Subgrade values for Horizontal Offset, Distance and Pivot Offset can be specified by template ID. For example, EP could be used in Distance to have the subgrade have a width of the EP grade. Also expressions can be used such as EP+5 to go the distance of the EP segment plus 5. This is especially useful for template transitions so that if the EP grade varies the subgrade width will automatically adjust.



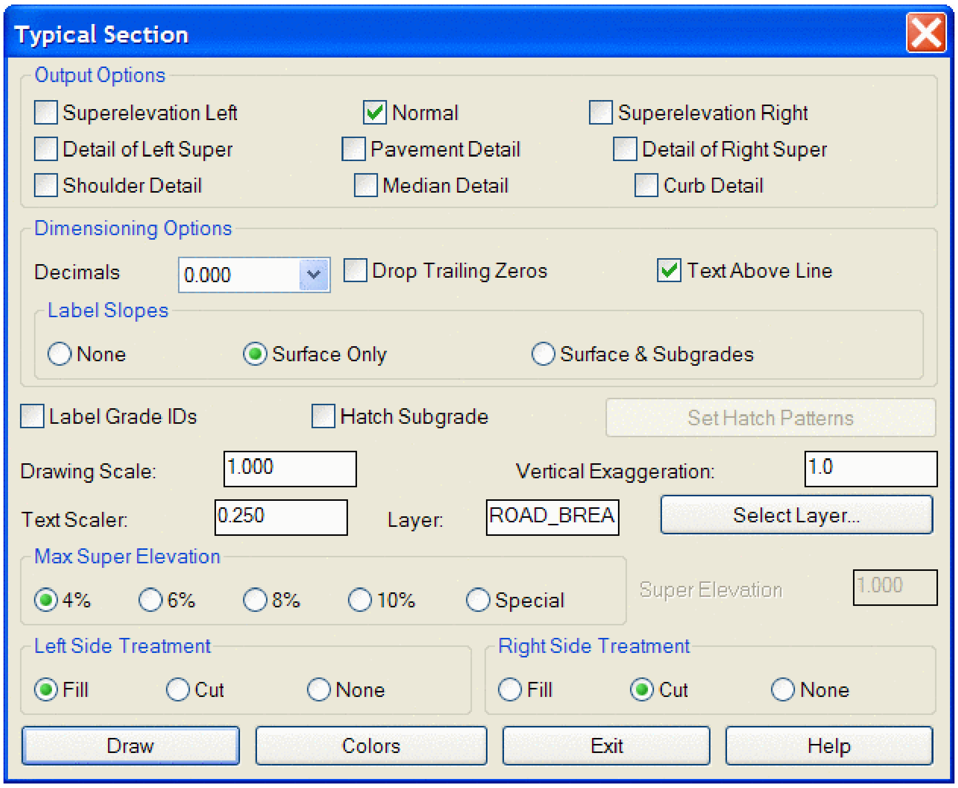
Example of Wrap Around Subgrade

Pulldown Menu Location: Roads
Keyboard Command: template
Prerequisite: None

Draw Typical Template

This command draws a template and labels the slopes and distances. The cut and fill treatment can be shown on the left and/or right sides. All the cut/fill slopes are shown for the different depths when multiple slopes are defined. There are options to draw the normal template, super elevation or details of different sections.

You will be prompted to select the template (.TPL) file first, then the Typical Section dialog appears. Specify the parameters and press the Draw button.


Typical Section

Output Options

☐ Superelevation Left ☑ Normal ☐ Superelevation Right
☐ Detail of Left Super ☐ Pavement Detail ☐ Detail of Right Super
☐ Shoulder Detail ☐ Median Detail ☐ Curb Detail

Dimensioning Options

Decimals: 0.000 ☐ Drop Trailing Zeros ☑ Text Above Line

Label Slopes: ○ None ● Surface Only ○ Surface & Subgrades

☐ Label Grade IDs ☐ Hatch Subgrade

Drawing Scale: 1.000
Vertical Exaggeration: 1.0
Text Scaler: 0.250
Layer: ROAD_BREA

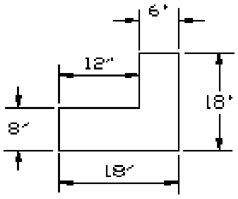
Max Super Elevation: ● 4% ○ 6% ○ 8% ○ 10% ○ Special
Super Elevation: 1.000

Left Side Treatment: ● Fill ○ Cut ○ None

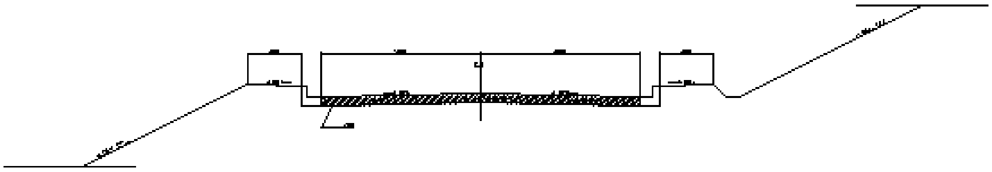
Right Side Treatment: ○ Fill ● Cut ○ None

Prompts

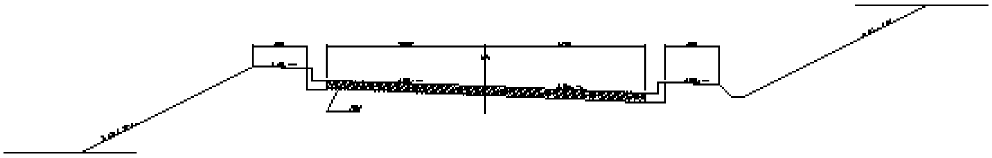
Template File to Read Specify a template file.
Typical Section dialog Set your options then click Draw.
Pick Starting Position: *pick a point*



Curb Detail



Normal Typical Template



Typical Template with Left Super Elevation

Pulldown Menu Location: Roads
Keyboard Command: typical
Prerequisite: A template file (.TPL file)

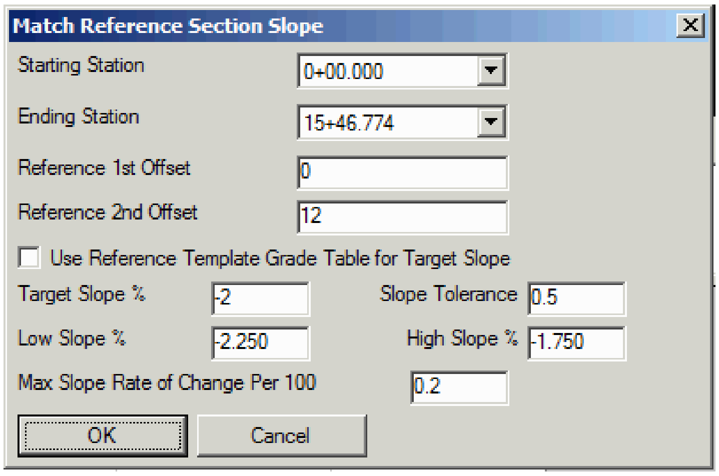
Template Grade Table

This command creates a Template Grade Table file (.TGT), which is a lookup file for slopes and distances at stations for grade points within a template. Each side of the template is controlled independently. This user interface provides a simple and easy way to handle complex transitions. A similar result could be produced using a Template Series, or a combination of Template Grade Centerline for horizontal control and Template Grade Profile for vertical control. The advantage of Template Grade Table is that it provides a simpler solution. Besides handling transitions like lane widening, it can also be used to specify superelevation control.

A Template Grade Table can be used on a single road with Process Road Design command, or specified for specific roads within a Road Network.

The Template Grade Table is associated with an existing typical template (.TPL) file.

The Match Slope function assigns slopes to the grade table using cross slopes from a reference section file. This function can be used to match the template slopes to existing slopes such as for road rehabilitation to match the new road cross slopes to the existing. After selecting the reference section file, there is a dialog to set the range of stations to process and the offsets of the sections to get the cross slope from. The second offset is optional. When only one offset is specified, the program uses the existing slope at the offset. When both offsets are set, the slope is calculated between the two offset points on the existing surface. The Lowest and Highest Slope % settings are optional restrictions on the transition slopes. The Low/High Slope range can also be set by entering the Target Slope and Slope Tolerance. The Use Reference Template Grade Table for Target Slope option is a method to match the slope within the Slope Tolerance to a variable slope. For example, this option applies when matching an existing road that is transitioning through superelevation. When active, this option will make the program prompt for a separate Template Grade Table to use for the slope reference. The Max Slope Rate of Change Per 100 is an optional restriction on how quickly the slopes can change between stations. If you don't want to use a restriction, you can leave the field blank or set a high value.



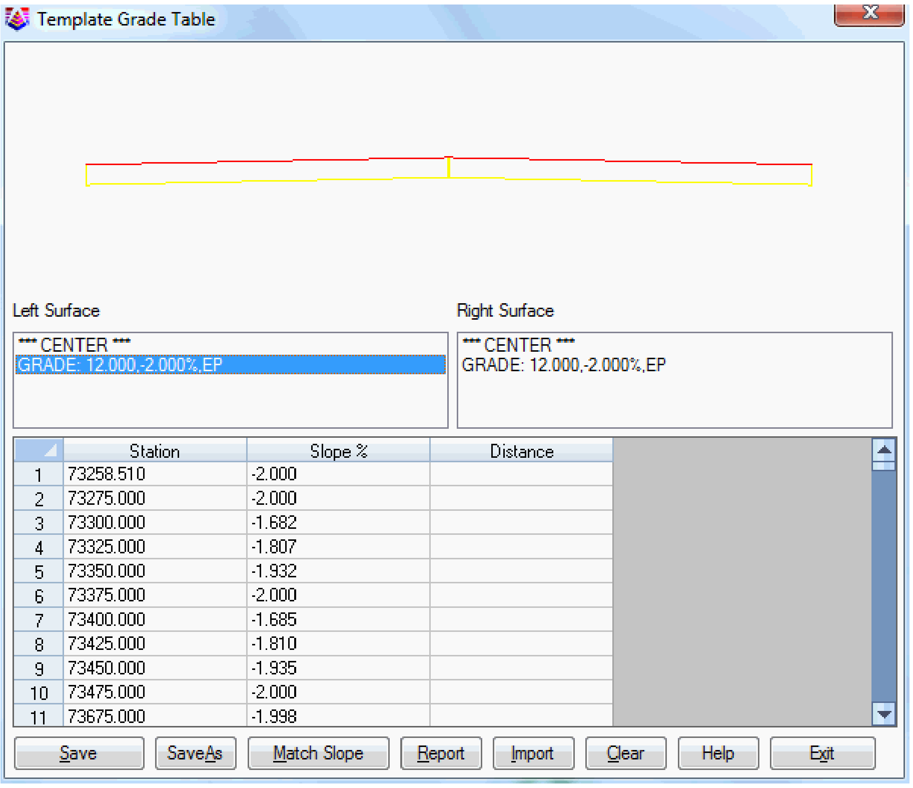
Starting Station: 0+00.000
Ending Station: 15+46.774
Reference 1st Offset: 0
Reference 2nd Offset: 12
☐ Use Reference Template Grade Table for Target Slope
Target Slope %: -2
Slope Tolerance: 0.5
Low Slope %: -2.250
High Slope %: -1.750
Max Slope Rate of Change Per 100: 0.2

The Report function shows all of the slope and distance changes for all of the template grades.

The Import function reads in transition data to the currently highlighted grade in the list. The data can come from either a text file, drawing graphics or superelevation file. For the text file, the format should have station, slope% and distance separated by a delimiter such as a comma. For the drawing graphics, the import reads a polyline on a superelevation diagram grid to set the transition slopes. For superelevation file method, the import reads the transition slopes from a .sup file.

Prompts

Template Grade Table to Edit/Create Choose New to create a new Template Grade Table, or Edit to modify an existing one.
Template File to Process: When creating a new Template Grade Table, an existing Template file must be selected to be used with it. When editing an existing .TGT, the Template previously associated with it will be automatically loaded with it.
Template Grade Table dialog



Left Surface

*** CENTER ***
GRADE: 12.000,-2.000%,EP

Right Surface

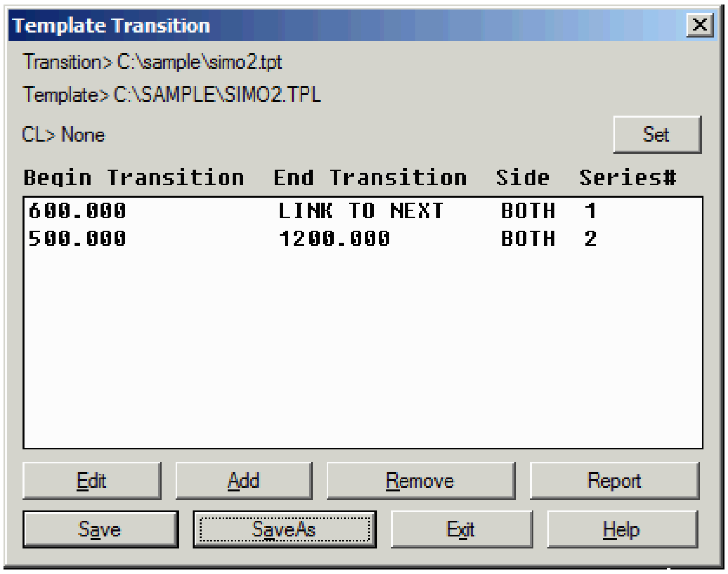
*** CENTER ***
GRADE: 12.000,-2.000%,EP

	Station	Slope %	Distance
1	73258.510	-2.000	
2	73275.000	-2.000	
3	73300.000	-1.682	
4	73325.000	-1.807	
5	73350.000	-1.932	
6	73375.000	-2.000	
7	73400.000	-1.685	
8	73425.000	-1.810	
9	73450.000	-1.935	
10	73475.000	-2.000	
11	73675.000	-1.998	

Pulldown Menu Location: Roads
Keyboard Command: tpltable
Prerequisite: A template .TPL file

Template Transition

This command creates a template transition file (.TPT file) that can be used for the commands *Locate Template Points* and *Process Road Design*. The template transition is associated with a typical template (.TPL) file. The template transition file defines changes in grade distances or slopes for a specific template ID through a specified range of stations. Lane widths, for example, can be made to expand and contract. You can only modify existing template grades. Template Transition does not allow curbs, medians, subgrades or cut/fill treatment to be modified. Also new template elements cannot be added and existing elements cannot be removed. For this reason, lanes of road that "emerge" and slope distinctly from standard road lanes would need to be entered as small (0.001 in width) segments in the original template, available for expansion using Template Transition. Template Transition offers one of 3 ways to change template widths and slopes. Another way involves use of Template Point Profile and Template Point Centerline, where a particular template ID can be directed to follow a specific profile and centerline of its own. The third method is template-to-template transitions using Input-Edit Template Series, where distinct templates transition one to another. All three methods require that template IDs "pre-exist" in order to be expanded, or to follow profiles and centerlines, or to transition between template files. So the technique of making very short phantom segments for emerging and disappearing "lanes" or roads with distinct grades is universal. If special slopes are not involved, lanes can expand and contract without creation of phantom segments in the original template. Only clever use of Input-Edit Template Series, where templates with no curbs could "end" and templates with curbs can begin at specified stations, can effectively make "new" features like curbs and medians materialize.



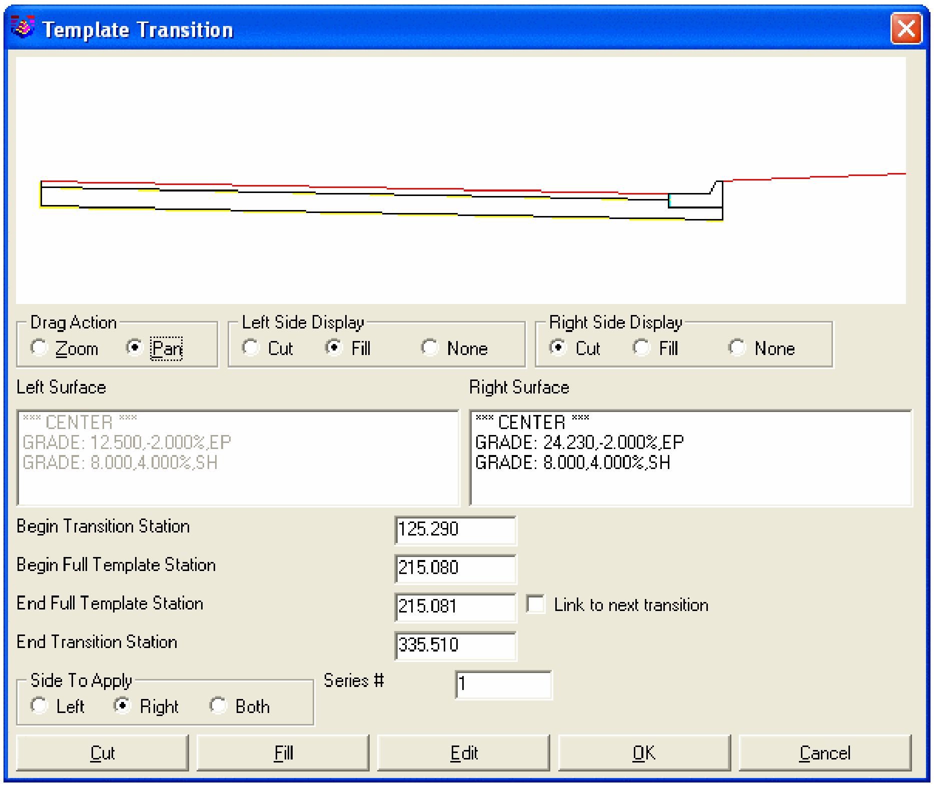
Template Transition
Set
Edit
Add
Remove
Report
Save
SaveAs
Exit
Help

Transition> C:\sample\simo2.tpt

Template> C:\SAMPLE\SIMO2.TPL

CL> None

```
Begin Transition  End Transition  Side  Series#
600.000            LINK TO NEXT    BOTH   1
500.000            1200.000        BOTH   2
```



Template Transition
Cut
Fill
Edit
OK
Cancel

Drag Action: ○ Zoom ● Pan

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ● Cut ○ Fill ○ None

Left Surface:
*** CENTER ***
GRADE: 12.500,-2.000%,EP
GRADE: 8.000,4.000%,SH

Right Surface:
*** CENTER ***
GRADE: 24.230,-2.000%,EP
GRADE: 8.000,4.000%,SH

Begin Transition Station: 125.290

Begin Full Template Station: 215.080

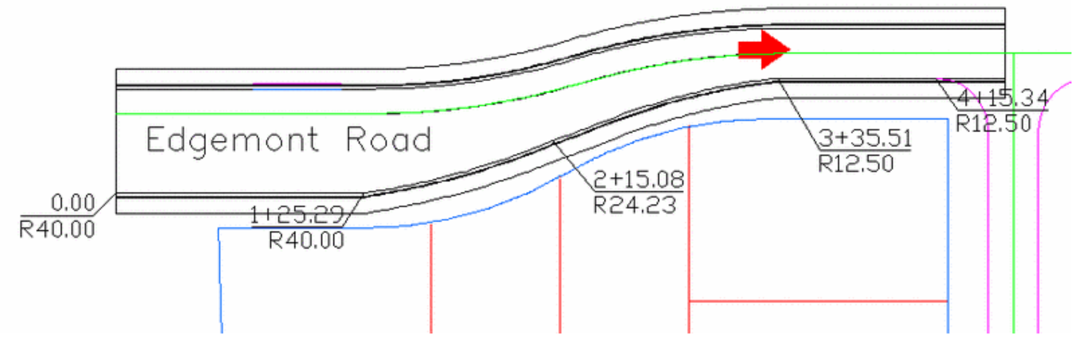
End Full Template Station: 215.081 ☐ Link to next transition

End Transition Station: 335.510

Side To Apply: ○ Left ● Right ○ Both

Series #: 1

Reviewing the below plan view, when you are given stations and offsets that define a template position like edge-of-pavement (above), you can use Template Transition effectively.



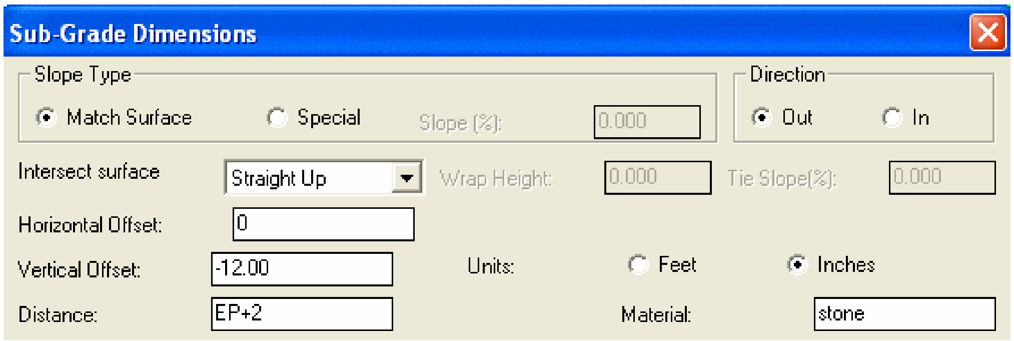
Edgemont Road
0.00
R40.00
1+25.29
R40.00
2+15.08
R24.23
3+35.51
R12.50
4+15.34
R12.50

The first Template Transition dialog shows a list of the transitions, covering the above right-lane variable width. To add a transition, click the Add button. This brings up the second Template Transition dialog which shows the transition template for the second segment. The middle sections list the template grades that can be changed. To modify a grade, highlight the grade and click the Edit button. The Report function creates a report of the template transition data.

The Begin Transition Station is where the normal template begins to transition to the modified template. The Begin Full Template Station is where the modified template is used entirely. The End Full Template Station is where the template starts to transition back to normal. The End Transition Station is where the template has returned to normal. This method is designed for elements like passing lanes which expand from normal then contract back to normal. But you can also use this method for roads that start off or end expanded or altered. For example, to start off the road at a 40' edge-of-pavement dimension, it is necessary to transition up from 12.5' (normal dimension). If you need to have 40' at station 0, then enter station -0.01 as the "Begin Transition Station", and enter station 0 as the "Begin Full Template Station". Select the EP grade in the dialog, and change it to 40'. Then click "Link to next transition". The Link to Next Transition option joins the current transition to the next transition without returning to the normal template. This takes you to the second dialog, shown above. You sustain the 40' width from Begin Transition Station 125.29 and transition at station 215.08 to a 24.23' dimension. Then quickly end the transition at station 215.081 for the "End Full Template Station". Finally, transition back to normal 12.5' by entering 335.51 for "End Transition Station".

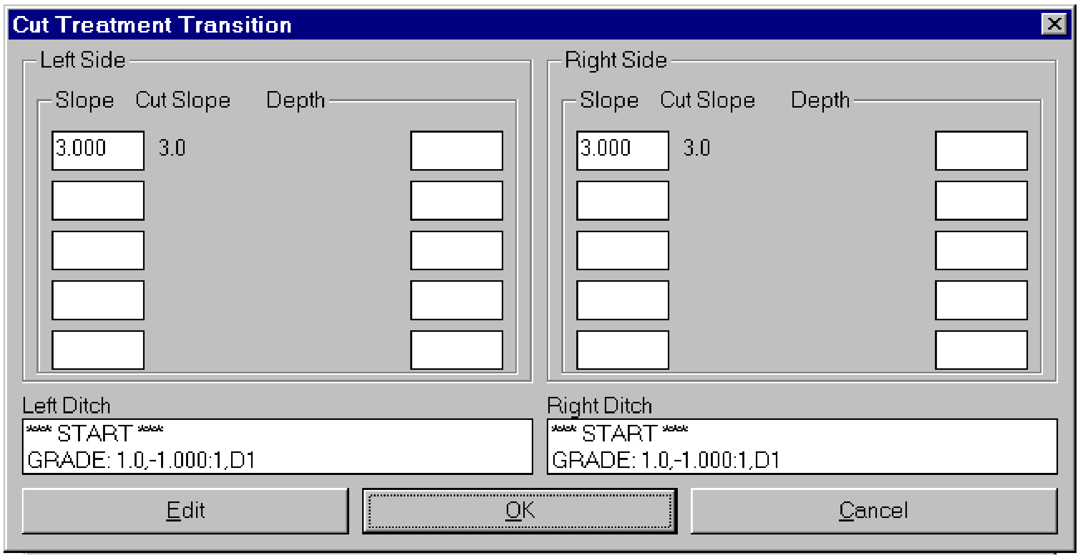
The Series # setting is for grouping a sequence of transitions separately from other transitions. This Series # allows for independent transitions over the same station range. All transition changes that are part of the same transition should be given the same Series #. For example, when a grade on the right side of the road transitions separately from a grade on the left side of the road, all the transitions for the right side grade could be assigned as Series #1 and all transitions for the left side grade could be assigned as Series #2.

There is another "trick" to using Template Transition with templates that include subgrades. The subgrades will not automatically extend and follow the expanded grade IDs such as EP for "edge-of-pavement", unless the subgrades are defined in terms of the IDs themselves within Design Template. Subgrades that expand "at slope" to intersect a curb, for example, can expand naturally as the curb position moves outward on the right side. But subgrades that go "straight up" at back of curb at offset 14.5' in this example will stay at 14.5', unless defined as shown below by referencing the "EP ID:


Sub-Grade Dimensions

Slope Type: ● Match Surface ○ Special Slope (%): 0.000
Direction: ● Out ○ In
Intersect surface: Straight Up
Wrap Height: 0.000
Tie Slope(%): 0.000
Horizontal Offset: 0
Vertical Offset: -12.00
Units: ○ Feet ● Inches
Distance: EP+2
Material: stone

Cut and Fill slopes can also be transitioned by picking the Cut and Fill buttons. Ditch and Berm grades can also be modified here.



Left Side: Slope 3.000, Cut Slope 3.0

Right Side: Slope 3.000, Cut Slope 3.0

Left Ditch:
*** START ***
GRADE: 1.0,-1.000:1,D1

Right Ditch:
*** START ***
GRADE: 1.0,-1.000:1,D1

Transitions can also be applied to the left, right or both sides. This allows you to have separate overlapping transitions for the left and right sides.

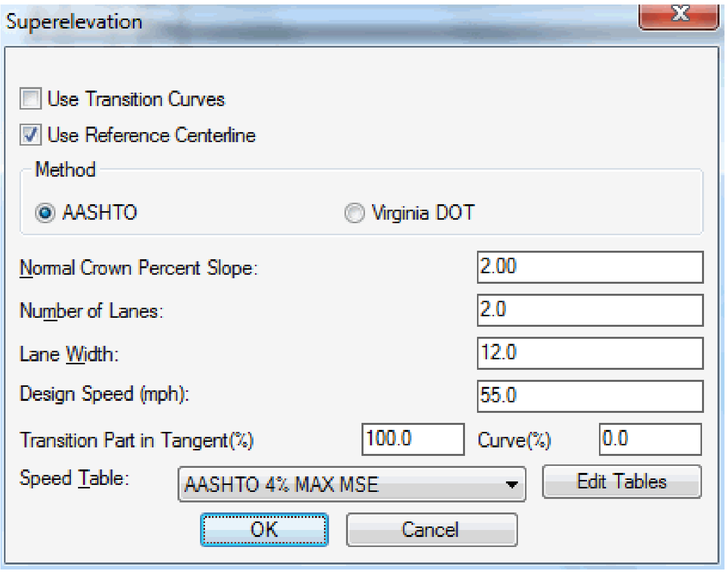
Prompts

Template Transition to Edit/Create Choose New to create a transition file or Edit to modify a transition file
Template File to Edit: Specify a transition file
Template Transition dialog

Pulldown Menu Location: Roads
Keyboard Command: tpltrans
Prerequisite: A template .TPT file

Input-Edit Super Elevation

This command is an editor for super elevation stationing. The super elevation data is stored in new or existing super elevation (.SUP) files. When creating a new super elevation file, there is an option to read a centerline file and build the super elevation stationing based on the curves and spirals in the centerline using AASHTO-based stationing or optionally, the Virginia DOT method. The AASHTO calculations are based on the equations in chapter 3 of the 2004 Green Book titled Geometric Design of Highway and Streets. The length of the transition from normal crown to superelevation will be automatically computed by the program using either method based on the design speed and other settings, but the user can control what percentage of this transition to and from superelevation occurs in the tangent leading up to the curve or in the curve itself. The Use Transition Curves option enables fields for the transition curves at each super elevation grade break. For example, if a normal grade is -2% and it starts changing at station 1+00 to reach 4% as station 2+00, then you could have a transition at 1+00 to go from the constant -2% to the rate of change of 6% over 100'. This transition curve will show up in the Draw Superelevation Diagram similar to a vertical curve in Draw Profile.

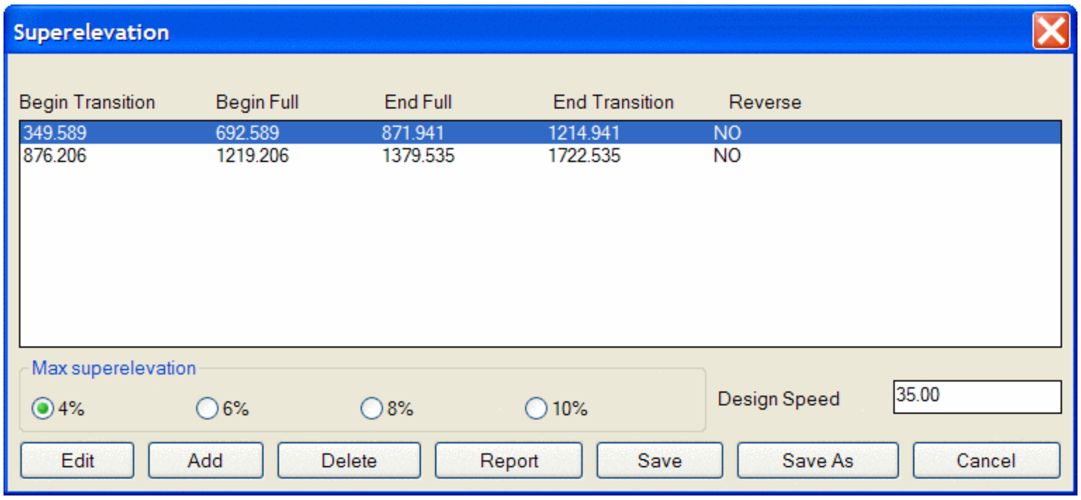

Superelevation

☐ Use Transition Curves
☑ Use Reference Centerline

Method
● AASHTO ○ Virginia DOT

Normal Crown Percent Slope: 2.00
Number of Lanes: 2.0
Lane Width: 12.0
Design Speed (mph): 55.0
Transition Part in Tangent(%) 100.0 Curve(%) 0.0
Speed Table: AASHTO 4% MAX MSE

The main superelevation dialog displays a list of each super elevation transition. These entries should be sequentially entered from lowest to highest stations. To edit the super elevation stationing, highlight the entry line and click Edit. The Add button creates a new entry below the current highlighted row or at the top of the list if no row is highlighted. The Delete button removes the highlighted row from the list. The Save button saves the super elevation file. To exit the program without saving, click the Cancel button.

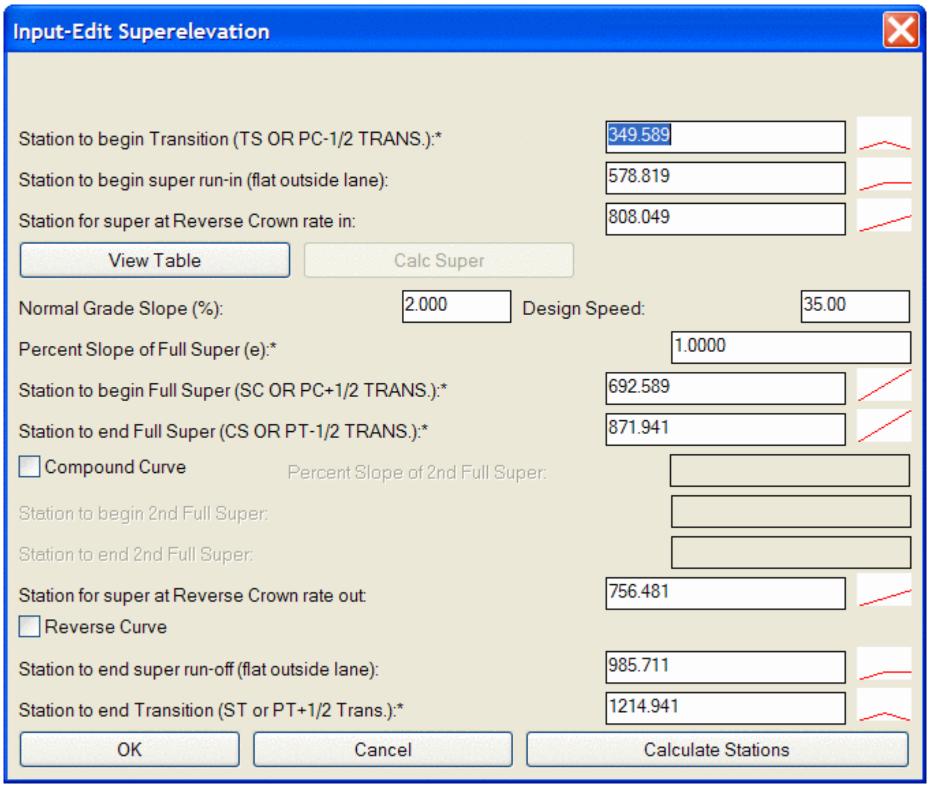

Superelevation

Begin Transition	Begin Full	End Full	End Transition	Reverse
349.589	692.589	871.941	1214.941	NO
876.206	1219.206	1379.535	1722.535	NO

Max superelevation
● 4% ○ 6% ○ 8% ○ 10%

Design Speed 35.00

The super elevation stationing is entered in the Input/Edit Superelevation dialog. The View Table button shows a table of the super elevation slope for the delta angle and radius at different design speeds. The Calc Super button calculates the slope of full super given the design speed. The station entries are defined as follows:

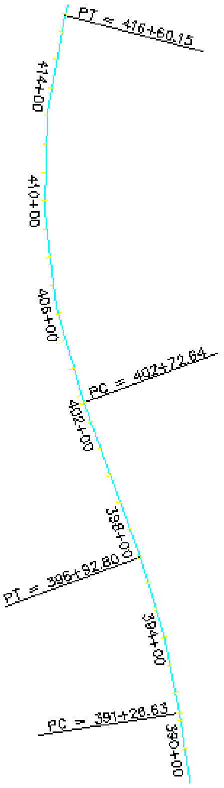

Input-Edit Superelevation

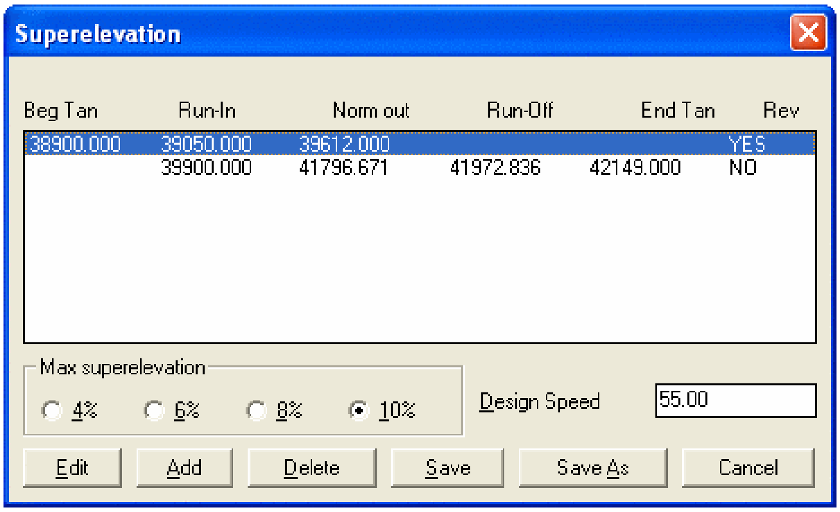
Station to begin Transition (TS OR PC-1/2 TRANS.):* 349.589
Station to begin super run-in (flat outside lane): 578.819
Station for super at Reverse Crown rate in: 808.049
Normal Grade Slope (%): 2.000
Design Speed: 35.00
Percent Slope of Full Super (e):* 1.0000
Station to begin Full Super (SC OR PC+1/2 TRANS.):* 692.589
Station to end Full Super (CS OR PT-1/2 TRANS.):* 871.941
☐ Compound Curve
Percent Slope of 2nd Full Super:
Station to begin 2nd Full Super:
Station to end 2nd Full Super:
Station for super at Reverse Crown rate out: 756.481
☐ Reverse Curve
Station to end super run-off (flat outside lane): 985.711
Station to end Transition (ST or PT+1/2 Trans.):* 1214.941

Station to begin transition: where normal crown rate begins to transition
Station to begin super run-in: where slope becomes flat
Station for super at normal crown rate in: where slope equals negative of normal crown rate
Station to begin full super: where slope reaches full super slope
Station to end full super: where slopes begins to transition from full super back to normal
Station for super at normal crown rate out: where slope equals negative of normal crown
Station to end super runoff: where slope becomes flat
Station to end transition: where slope returns to normal crown rate

Given these various Station settings, an unequal rate of change can occur between any two stations. However, the program can calculate the stations to set an even rate of transition, as long as it knows the max superelevation, the normal crown slope and the station to start transition, start full super, end full super and end transition. The Calculate Stations button therefore calculates the stations for begin run-in, normal crown rate in, normal crown rate out and end super run-out. To calculate these stations the values with an "$*$" must be entered.

The Compound Curve option allows you to specify a second superelevation slope for a compound curve. In addition to specifying the second slope, the starting and ending stations for this slope must also be entered. The Reverse Curve option is similar to the Compound Curve option. A typical Reverse Curve is shown below in plan view and as it would appear in the summary dialog:


PT = 416+60.15
414+00
410+00
406+00
PC = 402+72.64
402+00
398+00
PT = 396+92.80
394+00
PC = 391+28.63
390+00


Superelevation

Beg Tan	Run-In	Norm out	Run-Off	End Tan	Rev
38900.000	39050.000	39612.000			YES
	39900.000	41796.671	41972.836	42149.000	NO

Max superelevation
○ 4% ○ 6% ○ 8% ● 10%

Design Speed 55.00

Edit
Add
Delete
Save
Save As
Cancel

Station 399+00 is the "pivot" where superelevation left flattens and turns into superelevation right.

Prompts

New or Existing Super Elevation File dialog
Superelevation File to Process Specify a superelevation file.
Superelevation Editor dialog

Pulldown Menu Location: Roads
Keyboard Command: super
Prerequisite: None

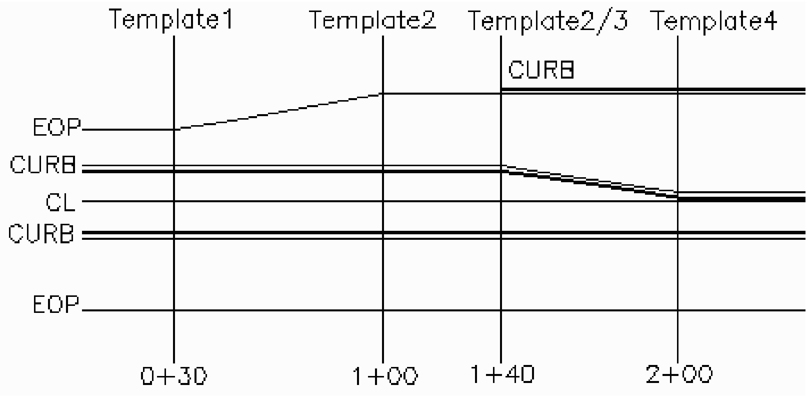
Input-Edit Template Series

Template Series is another method of widening lanes or causing templates to change: direct template-to-template transitioning. Using this command, you specify the station where one template "ends" and the station where another template "begins", and the program auto-transitions between templates.

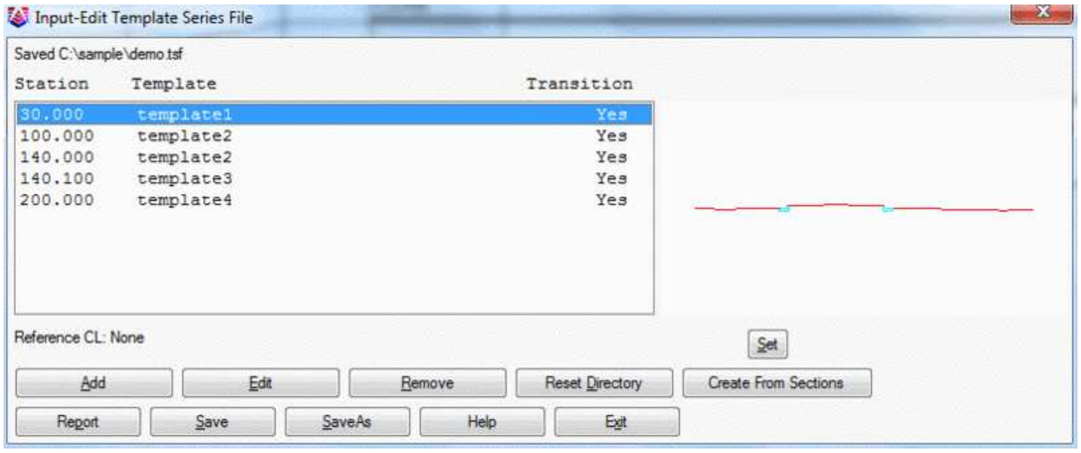
The Template Series is stored in a .TSF file and consists of a sequence of template file names (.TPL) with stationing. The Design Template command is used to create the .TPL files. The Template Series can be used in commands like Process Road Design and Road Network. In these commands, the template selection can be either a regular template (.TPL) or the template series (.TSF).

For the transition to work optimally, the templates should share the same IDs so that the program can connect the template 3D polylines and transition between templates. If the templates are distinct with separate, unrelated IDs, then by ending template1 at station 500 (for example) and starting template2 at station 500.01, a very abrupt transition can be accomplished.

For a design with transitioning templates, the Template Series method is an alternative to the Template Transition method, a third method of Template Grade Table, and to a forth method of using Template Point Profiles and Template Point Centerlines, where a template ID "follows" a particular centerline and profile. One advantage of the Template Series approach is that it can be used to link different templates together, like non-curb and curb templates, as shown here in plan view:



For the above example, Template 1 applies from station 0+00 to 0+30, then transitions to Template 2 at 1+00 which has a wider EOP distance. This transition occurs between stations 0+30 and 1+00. Then the full Template 2 continues until station 1+40. Then Template 3 starts with a curb replacing a standard EOP/Ditch combination on the left side. So Template 3 would be set to begin at 1+40.1, a short distance past 1+40. This template transitions into Template 4 at station 2+00. Template 4 has a shorter middle grade on the left side. You do not need to enter start and ending templates at station 0+00 or after station 2+00. Therefore, the dialog for this example might look as follows:



Saved C:\sample\demo.tsf

Station	Template	Transition
30.000	template1	Yes
100.000	template2	Yes
140.000	template2	Yes
140.100	template3	Yes
200.000	template4	Yes

Reference CL: None

Note that you can run Process Road Design to review the design results in plan view, with entry of only the Design Template/Series, the Profile and the Centerline (items 1, 2 and 4 within Process Road Design). You do not need existing cross sections to use Process Road Design. If you process at an interval such as 10 over any desired station range, you can output the Template Polylines and verify the result in plan view. If no sections are found, the program will process from edge of shoulder left to edge of shoulder right, and omit cut and fill slopes. With the correct templates, this would reproduce the plan view shown above.

Input-Edit Template Series is also an effective way to accomplish superelevation, and even simultaneous superelevation and lane widening. Consider the "stages" of pivoting into superelevation of 3%. The first template might be called "Normal Crown" (the lower template). The second template might be called "Reverse Crown" (+2% cross slope). The third template might be called "Full Super" and would be the +3% template. You need the second template because you need to "restrain" the left-hand side of the road from pivoting until the continuous +2% cross slope is reached. If you only used the "Normal Crown" template, say, at station 4+00 and then the "Full Super" template at station 6+00, then at station 5+00, where 1/2 of the transition occurs, the left side cross slope would be -2.5% (transitioning halfway). In reality, the left side should not pivot until station 5+60. If the rate of pivoting is less from normal crown to flat outside lane, and the rate changes after that point, then you would need a fourth template to direct how the road transitions to full superelevation.

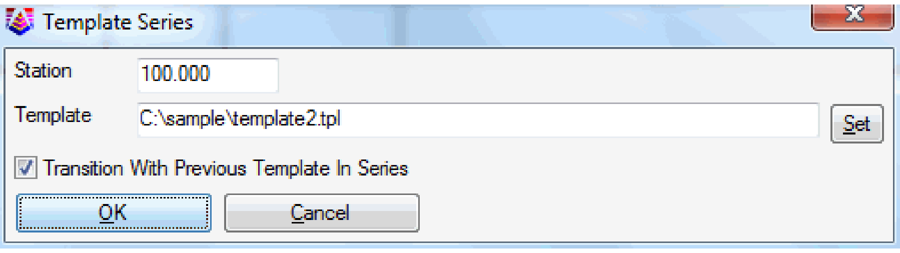
The Reference CL is optional. When it is set, then screen pick is an option for specifying the template transition stations.

The Report function has options for either a summary report of the stations and template, or a detailed report that adds the template dimensions.

The Reset Direction function applies when the folder for the template files (.TPL) has changed and you need to set a new location.

The Create From Sections function reads a section file for a design and creates templates at each change and fills in the template series with these templates. The section file must have descriptions on the section points (ie "EOP").

Here is the dialog for adding and editing templates for the series where you set the template name and station to apply. The Transition With Previous Template In Series will match any common template ID's with the previous template and linear interpolate any changes in distance or slope for the stations between the templates. Otherwise, the template dimensions are held unmodified up to the midway station between the templates where the switch occurs.


Template Series

Station: 100.000

Template: C:\sample\template2.tpl

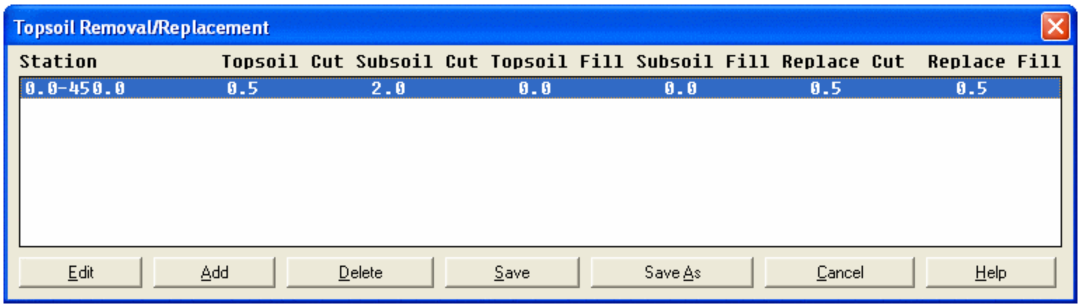
☑ Transition With Previous Template In Series

Pulldown Menu Location: Roads
Keyboard Command: tplseries
Prerequisite: Template Files

Topsoil Removal/Replacement

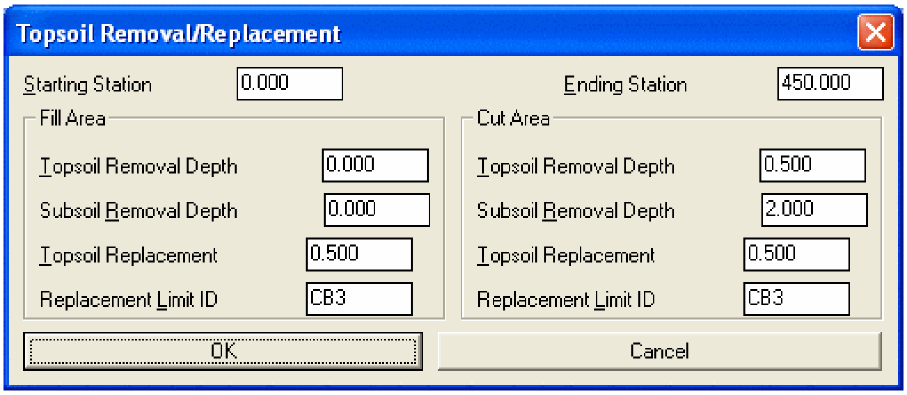
This command creates a topsoil definition (.TOP) file which defines topsoil removal and replacement zones to be used in the *Process Road Design* command. You can have different topsoil adjustments for different station ranges. These adjustments are applied to the existing ground section in the *Process Road Design* command and will effect the cut and fill volumes. *Process Road Design* will also report the amounts of topsoil removal and replacement.

The command starts by displaying a list of the topsoil stations in the dialog shown below. To add a topsoil adjustment, pick the Add button which brings up a second dialog. You can have different amounts of topsoil removal and replacement for areas in cut and areas in fill. Subsoil is another category of removal that will be combined with any topsoil removal. The Subsoil removal volume is reported separately from topsoil removal by Process Road Design. Subsoil is automatically removed from the site and not used in fill or as a replacement quantity. Therefore, the subsoil element applies only to unsuitable materials that need to be removed. In the example below, we are only removing topsoil in cut (where cutting must take place in any case), and in the cut, we are removing 2' of subsoil which will be hauled off site (since subsoil is not re-used). The removed 0.5' of topsoil in cut will then be replaced in both cut and fill zones of the road within the limits specified by the "Replacement Limit ID". (No topsoil will be replaced on paved surfaces!)


Topsoil Removal/Replacement

Station	Topsoil Cut	Subsoil Cut	Topsoil Fill	Subsoil Fill	Replace Cut	Replace Fill
0.0-450.0	0.5	2.0	0.0	0.0	0.5	0.5

The Replacement Limit ID is an option to limit the replacement to occur only within the template left offset Limit ID and the right offset Limit ID. If this Limit ID is left blank, then the program will apply the replacement between the left catch point and the right catch point. Topsoil removal is always applied between the catch points. The Limit ID corresponds to a template ID as set in the Design Template routine. Typically, you would use an ID like SH for shoulder and replace topsoil only from the far left and right tie/catch points to the SH or shoulder point. If you use a curb and want to replace topsoil to back of curb, keep in mind that the program takes the basic code "CB" and creates 3 curb points typically, so the back of curb would become CB3 in most L-shaped curbs.



Starting Station 0.000
Ending Station 450.000

Fill Area
Topsoil Removal Depth 0.000
Subsoil Removal Depth 0.000
Topsoil Replacement 0.500
Replacement Limit ID CB3

Cut Area
Topsoil Removal Depth 0.500
Subsoil Removal Depth 2.000
Topsoil Replacement 0.500
Replacement Limit ID CB3

If the Topsoil (".TOP") file is selected within Process Road Design, all quantities of topsoil removal and replacement and subsoil removal are reported, as shown below:

Processing 0+00.00 to 4+42.10

```
Total Topsoil Removed: 5219.22 C.F., 193.30 C.Y.
Total Subsoil Removed: 20876.89 C.F., 773.22 C.Y.
Total Topsoil Replaced: 5309.57 C.F., 196.65 C.Y.
Hauled-In Topsoil: 90.35 C.F., 3.35 C.Y.
Total Cut : 9106.52 C.F., 337.28 C.Y.
Total Fill: 16402.56 C.F., 607.50 C.Y.
Total SUBGRADE1 - asphalt: 2763.36 C.F., 102.35 C.Y.
Total SUBGRADE2 - stone: 9209.44 C.F., 341.09 C.Y.
Total CURB - concrete: 1078.37 C.F., 39.94 C.Y.
```

The cut reported in Process Road Design would be the remaining cut after topsoil and subsoil removal, and the fill would be the fill necessary to bring the grade to base of topsoil replacement, on top of which the topsoil is added. The removal of topsoil and subsoil usually creates less cut and more fill, as some of the cut is accomplished by the topsoil/subsoil removal, and in terms of fill, the grade must be brought up to replace the "cavity" created by the topsoil and subsoil removal. Topsoil removal depths and replacement depths can have a dramatic impact on cut and fill quantities, particularly on smaller scale projects like subdivision roads. In this example, every extra 0.1' of topsoil removal produces approximately 100 c.y. of net fill.

Prompts

Topsoil File to Read Specify a topsoil file.
Topsoil dialog Choose your options.

Keyboard Command: topsoil
Prerequisite: None

Assign Template Point Profile

This command assigns profile (.PRO) files to template point ID's like EP (edge of pavement), SH (shoulder) or DL (ditch line), storing this information in a template point profile (.TPP) file which can be used by the *Process Road Design* and *Road Network* commands. The purpose of the profile assignments is to allow separate profiles for template points that are independent of the centerline profile. For example, a ditch grade could have a different profile than the centerline. Multiple template point profiles can be assigned so the amount of control is unlimited. The Template Point Description corresponds to the name set in the *Design Template* command.

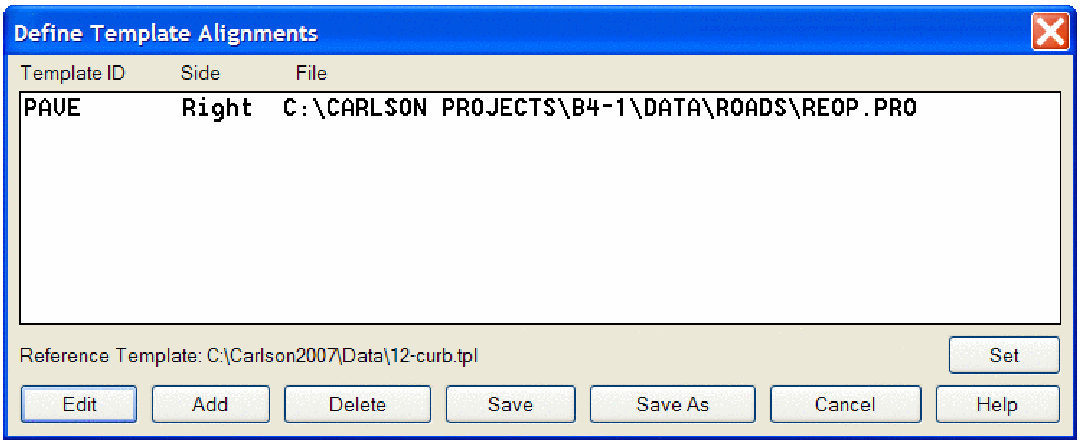
If you want the template ID point to follow a special slope or vertical alignment, use Assign Template Point Profile. The combination of using template point centerlines and profiles applied to particular template ID points is a design method sometimes referred to as "strings", where template elements string along special horizontal and vertical alignments. The rules of the template in terms of distances and slopes to the next point in the template will resume after the template point centerline and profiles are applied.

Prompts

First you are prompted to create a new Template Point Profile (.TPP), or edit an existing one.

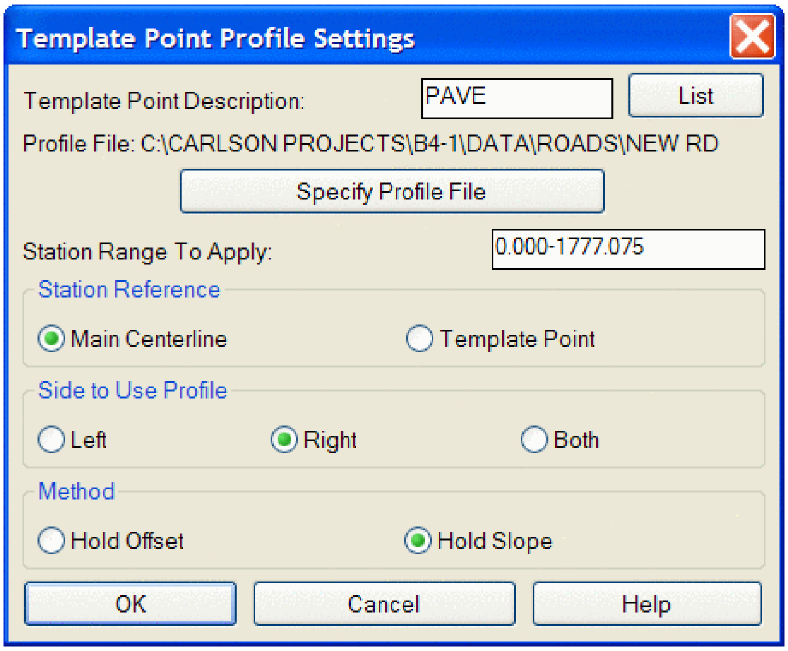
Next the Define Template Alignments dialog is presented, showing a list of existing Template ID-Profile assignments. To add a new assignment, first pick the Set button to set the Reference Template file (.TPL), then pick the Add button. This brings up the Template Point Profile Settings dialog. First, pick a Template Point Description from the List, which is derived from the components defined in the Template. Next, pick the Specify Profile File button, to choose the file (.PRO) to assign to the Template Point ID. Alternatively, instead of picking a profile, you can use the Screen Pick button to select a 3D polyline from the drawing which the program will use to generate a profile. Next, enter the Station range to Apply the assignment, select the Station Reference, specify if this assignment is for the Left, Right, or both sides of the main centerline, and finally specify the method to apply the assignment. Since the template ID profile can change the relative position of the template ID from the centerline, you have two options for how to fit in the template ID profile: Hold Offset or Hold Slope. Hold Offset will keep the same offset for the template ID and adjust the slope to the template ID. The Hold Slope will keep the same slope to the template ID and adjust the offset to reach the template ID profile elevation. Use Hold Offset when Template Point Profile is used in conjunction with Template Point Centerline, where a single template ID is defined to follow both a special and distinct horizontal alignment (centerline) and vertical alignment (profile).

Pick OK. Back in the Define Template Alignments dialog, pick Add to add another assignment, Edit to edit an existing assignment, Report to create a report of the template point profile data, Delete to delete a defined assignment, or Save to Exit.



Template ID	Side	File
PAVE	Right	C:\CARLSON PROJECTS\B4-1\DATA\ROADS\REOP.PRO

Reference Template: C:\Carlson2007\Data\12-curb.tpl



Template Point Description: PAVE

Profile File: C:\CARLSON PROJECTS\B4-1\DATA\ROADS\NEW RD

Station Range To Apply: 0.000-1777.075

● Main Centerline ○ Template Point

○ Left ● Right ○ Both

○ Hold Offset ● Hold Slope

Now Process the road design employing the newly defined Template Point Profile assignment. In the Process Road Design main dialog, pick the Template Point Profile button to select the new file (.TPP). You could also create a new Template Point Profile file directly from this dialog box by picking the Edit button and specifying a new file name.

Pulldown Menu Location: Roads
Keyboard Command: tppset
Prerequisite: Profile file (.PRO) or 3D polyline

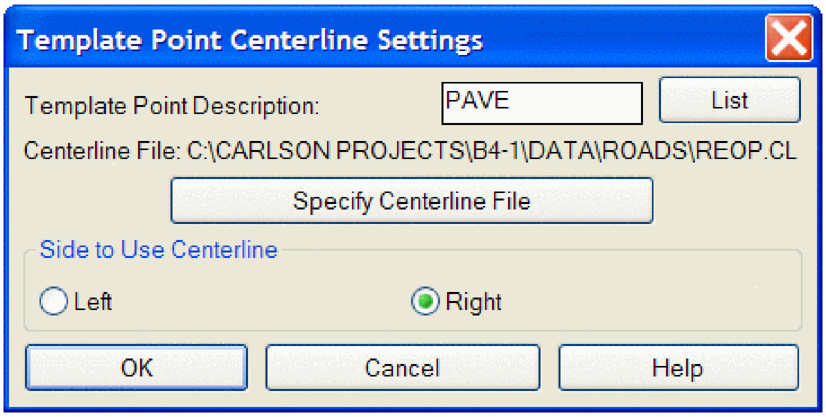
Assign Template Point Centerline

In roadway design situations involving varying pavement widths, the only effective way to control the edge of pavement positions is through the use of Assign Template Point Centerline. This command assigns centerline (.CL) files to template ID points, independent of the main centerline, thereby controlling the horizontal location of the edge of pavement. The assignment of Template ID points to centerline files (.CL) is stored in Template Point Centerline files (.TPC). These files are then used by the *Process Road Design* and *Road Network* commands. The slope to these template points is based on the parameters defined in *Design Template*. Subgrades can be made to follow template IDs if their offset distances are defined not by distance but by reference to the template ID.

Prompts

First you are prompted to create a new Template Point Centerline file (.TPC), or edit an existing one.

Next the Define Template Alignments dialog is presented, showing a list of existing Template ID-Centerline assignments. To add a new assignment, first pick the Set button to set the Reference Template file (.TPL), then pick the Add button. This brings up the Template Point Centerline Settings dialog. First, pick a Template Point Description from the List, which is derived from the components defined in the Template. Next, pick the Specify Centerline File button, to choose the file (.CL) to assign to the Template Point ID. Alternatively, you can use the Screen Pick button to select a polyline from the drawing that the program will use to generate a centerline. Finally, specify if this assignment is for the Left or Right side of the main centerline. Pick OK. Back in the Define Template Alignments dialog, pick Add to add another assignment, Edit to edit an existing assignment, Delete to delete a defined assignment, Report to create a report of the template point centerline data, or Save to Exit.

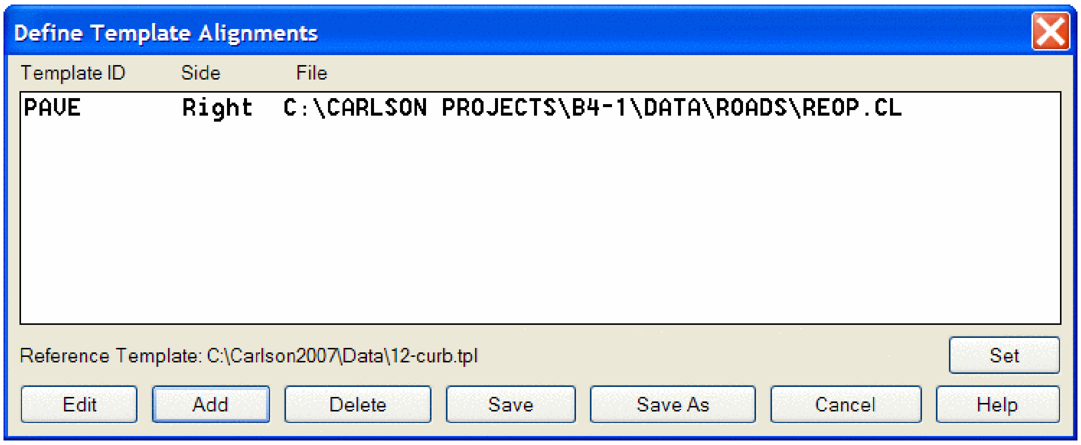

Template Point Centerline Settings
List
Specify Centerline File
OK
Cancel
Help

Template Point Description: PAVE

Centerline File: C:\CARLSON PROJECTS\B4-1\DATA\ROADS\REOP.CL

Side to Use Centerline

○ Left ● Right

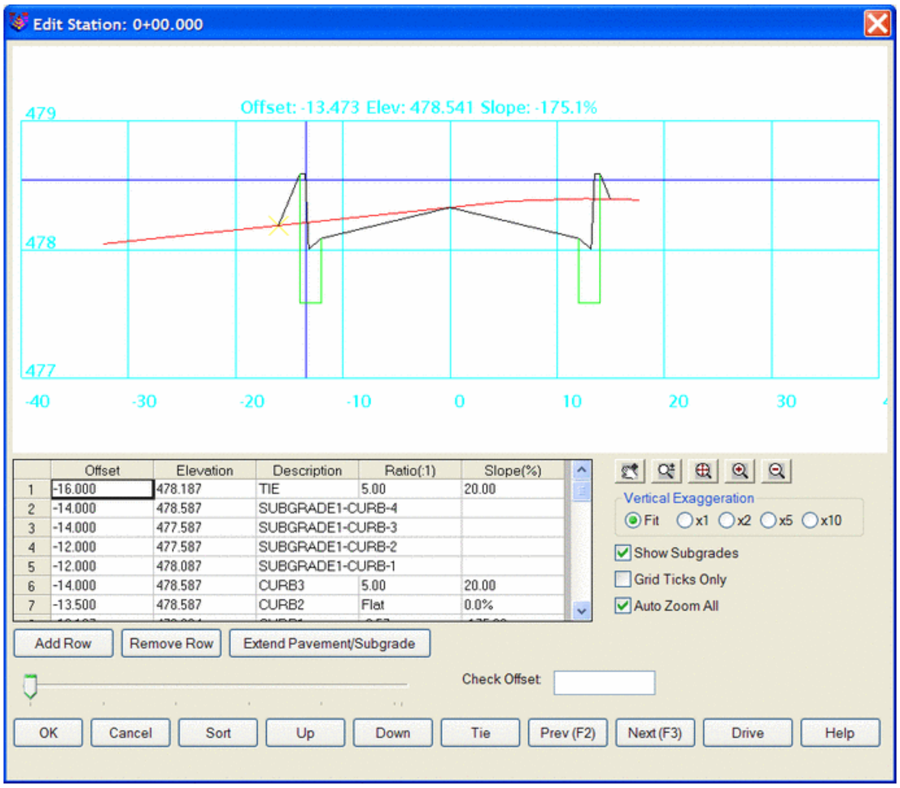

Define Template Alignments
Set
Edit
Add
Delete
Save
Save As
Cancel
Help

Template ID	Side	File
PAVE	Right	C:\CARLSON PROJECTS\B4-1\DATA\ROADS\REOP.CL

Reference Template: C:\Carlson2007\Data\12-curb.tpl

Now Process the road design employing the newly defined Template Point Centerline assignment. In the Process Road Design main dialog, pick the Template Pt Centerline button to select the new file (.TPC). You could also create a new Template Point Centerline file directly from this dialog box using the Edit button and specifying a new file name.

Here are two sections along the roadway, illustrating the varying lane widths on the right side of the main centerline. They are viewed with the *Input-Edit Section File* command on the Section menu.

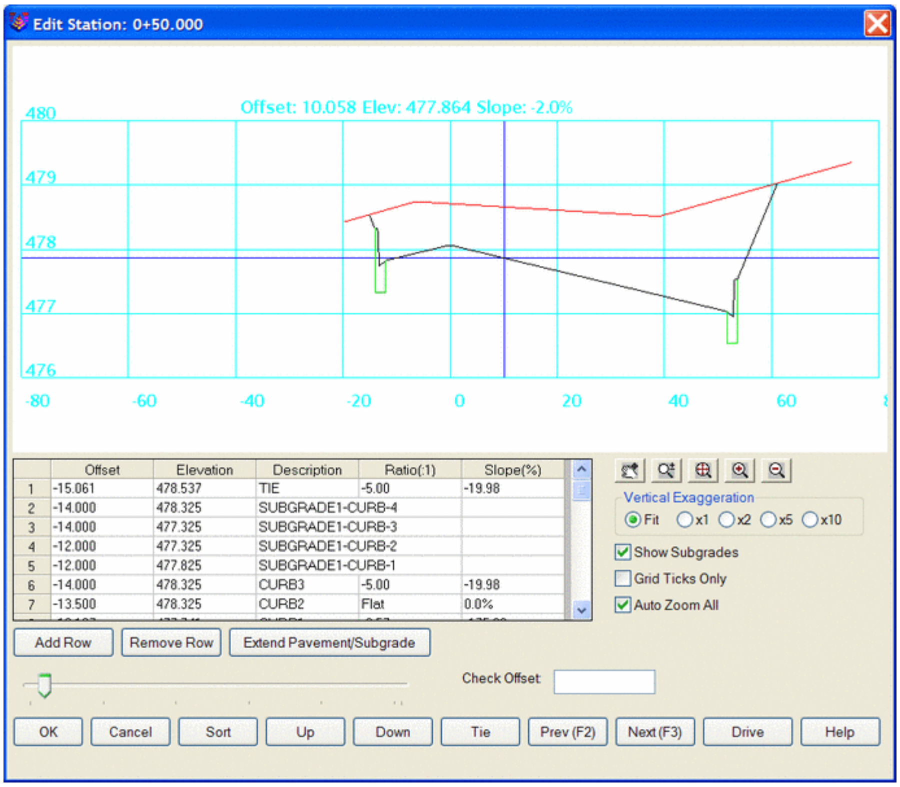

Edit Station: 0+00.000
Offset: -13.473 Elev: 478.541 Slope: -175.1%
479
478
477
-40
-30
-20
-10
0
10
20
30
Add Row
Remove Row
Extend Pavement/Subgrade
OK
Cancel
Sort
Up
Down
Tie
Prev (F2)
Next (F3)
Drive
Help

	Offset	Elevation	Description	Ratio(:1)	Slope(%)
1	-16.000	478.187	TIE	5.00	20.00
2	-14.000	478.587	SUBGRADE1-CURB-4		
3	-14.000	477.587	SUBGRADE1-CURB-3		
4	-12.000	477.587	SUBGRADE1-CURB-2		
5	-12.000	478.087	SUBGRADE1-CURB-1		
6	-14.000	478.587	CURB3	5.00	20.00
7	-13.500	478.587	CURB2	Flat	0.0%

Vertical Exaggeration
● Fit ○ x1 ○ x2 ○ x5 ○ x10

☑ Show Subgrades
☐ Grid Ticks Only
☑ Auto Zoom All

Check Offset


Edit Station: 0+50.000
Offset: 10.058 Elev: 477.864 Slope: -2.0%
480
479
478
477
476
-80
-60
-40
-20
0
20
40
60
Add Row
Remove Row
Extend Pavement/Subgrade
OK
Cancel
Sort
Up
Down
Tie
Prev (F2)
Next (F3)
Drive
Help

	Offset	Elevation	Description	Ratio(:1)	Slope(%)
1	-15.061	478.537	TIE	-5.00	-19.98
2	-14.000	478.325	SUBGRADE1-CURB-4		
3	-14.000	477.325	SUBGRADE1-CURB-3		
4	-12.000	477.325	SUBGRADE1-CURB-2		
5	-12.000	477.825	SUBGRADE1-CURB-1		
6	-14.000	478.325	CURB3	-5.00	-19.98
7	-13.500	478.325	CURB2	Flat	0.0%

Vertical Exaggeration
● Fit ○ x1 ○ x2 ○ x5 ○ x10

☑ Show Subgrades
☐ Grid Ticks Only
☑ Auto Zoom All

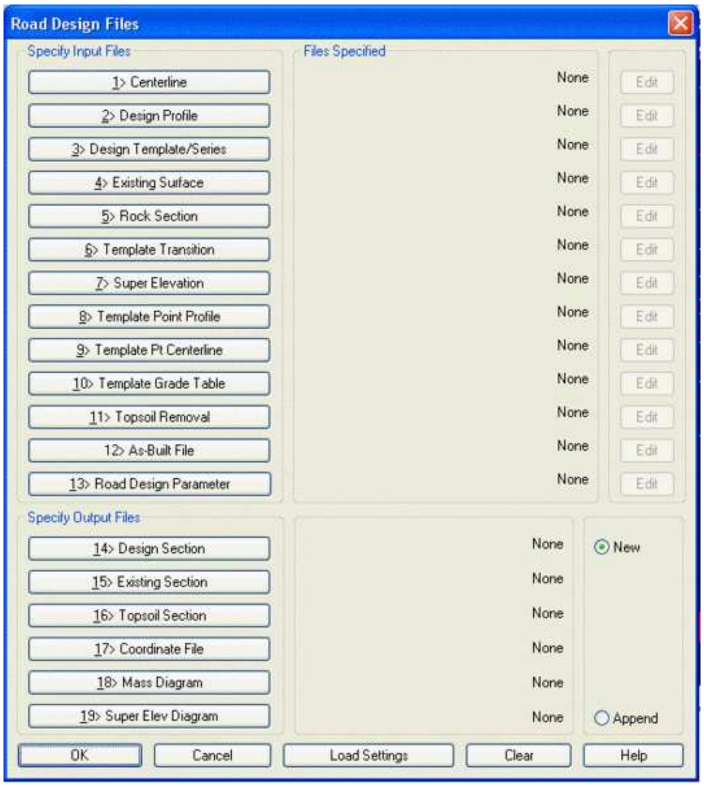
Check Offset

Pulldown Menu Location: Roads
Keyboard Command: tpcset
Prerequisite: Centerline file or polyline

Process Road Design

The primary function of this command is to assemble all of the components for a road design and process them together. While all of the Input Files can be created prior to accessing the Process Road Design command, all can be edited from the Road Design Files dialog, and many files can actually be created from the Road Design Files dialog itself. The actual processing of the Road Design essentially applies the design template at the design profile elevation along the specified centerline and computing the outslopes and earthworks relative to the existing ground surface. The earthworks report can be shown in the standard report viewer or customized with the Report Formatter option. Secondary functions include creating a final grade section file for plotting with the *Draw Section File* command, creating final grade points in a coordinate file, creating a final surface/contour model, and drawing the road as 3D polylines. You can also output a mass haul diagram profile. The program also has options for applying a superelevation file, template transition file, template point profile, template point centerline, rock section file, an as-built existing section file and a topsoil removal file. *Process Road Design* can be used not just for final road design computations but for levees, channels and any template-based application.

This command begins with the dialog shown below. The top section contains input Files. In a typical implementation of this command, you will have already defined a horizontal centerline for the design to follow, however, you could actually pick the Centerline button, pick the New tab, name the new centerline file (.CL), pick Open, and then back in the main Road Design Files dialog, pick the Edit button and layout the centerline design. The only component that you must have already created before running Process Road Design is #4, an Existing Surface file. As long as there is an Existing Ground Surface, the command will generate the Existing Ground Profile automatically, and the Proposed Finish Grade Profile can be created with the Edit button. Even a Design Template can be created right from here as well. Ultimately, the top 3 Input items (Centerline, Design Profile, and Design Template/Series) are required to Process a Road Design, leading to final sections and full contouring and 3D viewing. The Existing Surface is needed as well to process with earthwork calculations and tie slopes.


Road Design Files
Specify Input Files
Files Specified
1> Centerline
2> Design Profile
3> Design Template/Series
4> Existing Surface
5> Rock Section
6> Template Transition
7> Super Elevation
8> Template Point Profile
9> Template Pt Centerline
10> Template Grade Table
11> Topsoil Removal
12> As-Built File
13> Road Design Parameter
None
Edit
Specify Output Files
14> Design Section
15> Existing Section
16> Topsoil Section
17> Coordinate File
18> Mass Diagram
19> Super Elev Diagram
● New
○ Append
OK
Cancel
Load Settings
Clear
Help

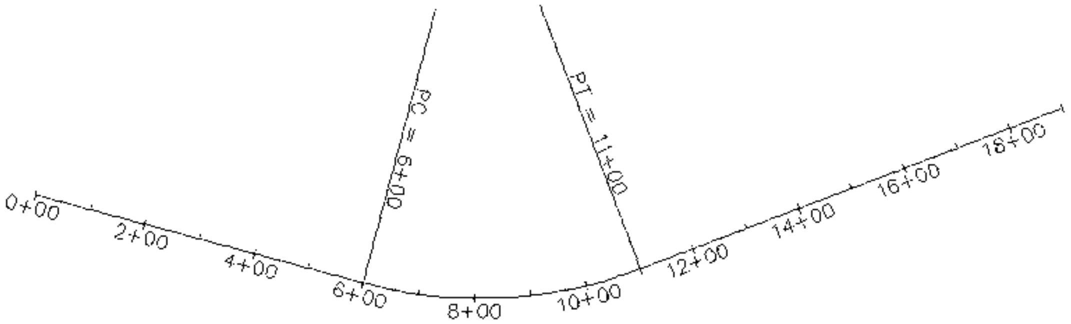
Input items 5 through 11 are strictly optional design files. It should be pointed out that items 8 and 9 (Template Point Profile and Template Point Centerline) enable template IDs to follow any defined centerline or profile and provide total flexibility of design. Lane widening, matching existing curb lines, special ditches, etc. can be easily accomplished with these two options. The template IDs simply "string along" or follow these pre-defined alignments, and the rules of the template apply to all other template ID points.

The Output Files section allows you to specify files to store the processing results. The Section File creates a final grade section file that can be drawn with *Draw Section File.* The Topsoil Section File creates the modified existing ground section file if Topsoil Removal is set in the input. This "post-topsoil removal" section file can be used for earthworks calculations to compare any stage of work, using *Calculate Sections Volume* under the Section pulldown menu. The Coordinate File creates a coordinate file containing every break point in the final grade. The point descriptions include the station, offset and template ID. Whether to include the subgrade points as well as the final surface points is determined by the Include SubGrade Points in Output CRD File option on the next dialog. To the right of the Output Files is the option to create new output files or append to existing output files. If you extend the road, or revise a portion of the project, you can simply "Append" rather than overwrite. The first time that you run this command for stations 0-1000, you would set Output Files to New. Then you could run this command again, possibly with new inputs, for stations 1000-2000 and set Output Files to Append.

On the next dialog, there is a Save Settings button to store all the settings from the first and second dialogs into a specified Road Design File with an (.RDF) file extension. Recorded (.RDF) files can be recalled later using the Load Settings option.

1> Centerline

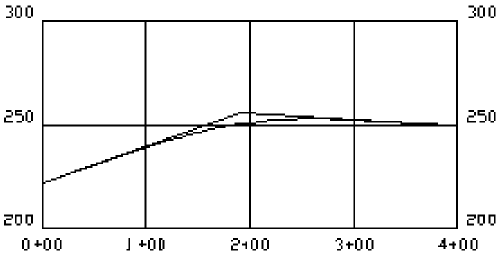
Specify the name of the Centerline file with this option. The (.CL) file contains the horizontal alignment geometry for a project. This parameter file must be specified if you want to have earthworks centroid corrections computed, generate final coordinates, Disturbed Area Polyline, and/or use Triangulate & Contour. The centerline file can be created by the *Design Centerline* or *Polyline to Centerline* commands in the Design pulldown menu.



Example Centerline

2> Design Profile

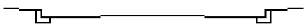
Specify the design profile (.PRO) file to derive the centerline elevations when the template is applied. This file defines the vertical alignment and is always required. The profile can be created with any of the profile creation routines in the Profile menu, but typically you would use *Design Road Profile* or *Input Edit Profile.*



Example Design Profile

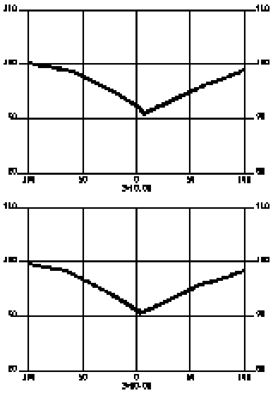
3> Design Template/Series

Specify a template definition (.TPL) file or template series (.TSF) file that defines the final grade offsets and elevations and the cut/fill slopes. The template file is created by the *Design Template* command and the template series file (a set of templates ordered by range of stations) is created using *Input-Edit Template Series*. A single template file or a template series file is required to run *Process Road Design.*


Example Design Template

4> Existing Surface

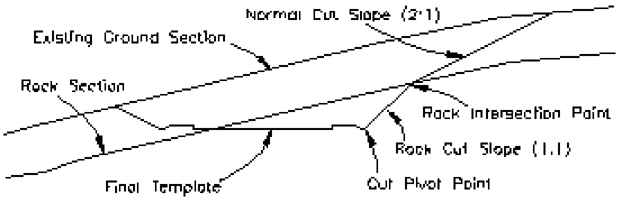
Specify the surface model which will be treated as the existing ground for cut and fill volumes and to calculate the outslope intersections when the template is applied at the profile elevations. This Existing Surface can be defined by either a section file or triangulation. The section file can be created with commands such as *Sections from Surface Entities*, *Input/Edit Section File*, *Sections from Points* or one of the *Digitize Sections* commands on the Section menu. The triangulation file can be created with the *Triangulate & Contour* command.



Example Existing Sections

5> Rock Section File

This option specifies an optional rock section file that is used as an additional surface. When in cut, a special cut slope is used up to the intersection of the rock surface. After this intersection, the normal cut slopes apply. The special rock cut slope is specified in Design Template under the cut options. If the "pivot point" in cut is below the rock line, then the special rock cut slope will be applied. Note that rock sections can be derived from borings to rock, as modeled, or can be created quickly by using the "translate" command within *Input-Edit Section File* to translate the existing ground sections by a vertical offset (e.g. -6) to an approximate top of rock.



Detail of rock cut slope

6> Template Transition File

Specify a .TPT file with this option. The Template Transition file allows modified template files to be applied at different ranges of stations on a project. In this way, template IDs can be made to widen (as for passing lanes) and contract. Use the *Template Transition* command under the Design menu to create a template transition file.

7> Super Elevation File

This option is used to specify a super elevation file (.sup file) that defines the super elevation transition stations on a project. The super elevation file can be created with the *Input-Edit Super Elevation* command.

8> Template Point Profile

This option lets you have separate profiles for template points that are independent of the centerline profile. This design file is created with the *Assign Template Point Profile* command.

9> Template Point Centerline

This option lets you have separate centerlines for template points that are independent of the main centerline. This design file is created with the *Assign Template Point Centerline* command.

10> Template Grade Table

This input file is optional. The Template Grade Table is a method for template transitions that uses a lookup table of distance and slopes at transition stations for each template ID. This design file is created with the *Template Grade Table* command.

11> Topsoil Removal

This option applies topsoil removal and/or replacement to the existing ground section file. This design file is create with the *Topsoil Removal/Replacement* command.

12> As-Built File

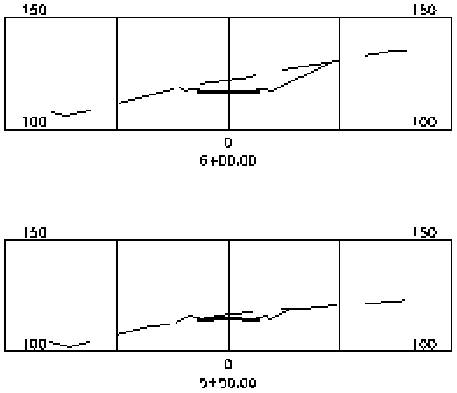
The As-Built File is a cross section file used to match existing grade and retain as-built portions of a road improvement project. The final cross sections will conform to the as-built cross sections for those template IDs specified in the second dialog. Beyond the specified set of offsets in the as-built cross section file, the design road files will be applied.

13> Road Design Parameter

This input file is optional for running checks on the road design for parameters such as min sight distance and max grades. This .RDP file is created with the *Define Road Design Parameters* command.

14> Output Design Section File

Specify the name of the file to output the final grade sections calculated by applying the template file at profile elevations and calculating the outslope intersection with the existing ground cross sections. This file can then be plotted by using the *Draw Section File* command. After plotting the final sections overlaid on the existing sections, revisions can be made graphically with commands like *PEDIT* and *Polyline by Slope Ratio*. The data output to the file can also be edited and reviewed with the *Input-Edit Section File* command. If the final sections are edited graphically, the revised section data can be updated in the .SCT file with the *Polyline to Section File* command.



Output Section File drawn with Existing Section File by the *Draw Section File* command

15> Output Existing Section File

This option creates a section file of existing ground. This applies when the existing surface is a triangulation file. The station intervals for the existing section file will match the stations from the design section file.

16> Output Topsoil Section File

This option writes out a modified existing ground section adjusted by the topsoil removal. This option is only valid if a Topsoil Removal file is being used.

17> Output Coordinate File

This option creates a coordinate file containing every break point in the final grade for the range of processed stations. Using the second dialog, there are additional options to output subgrade and ditch/berm points. The point descriptions include the station, offset and template ID. The station interval is set by the stations in the Existing Section File.

18> Output Mass Diagram File

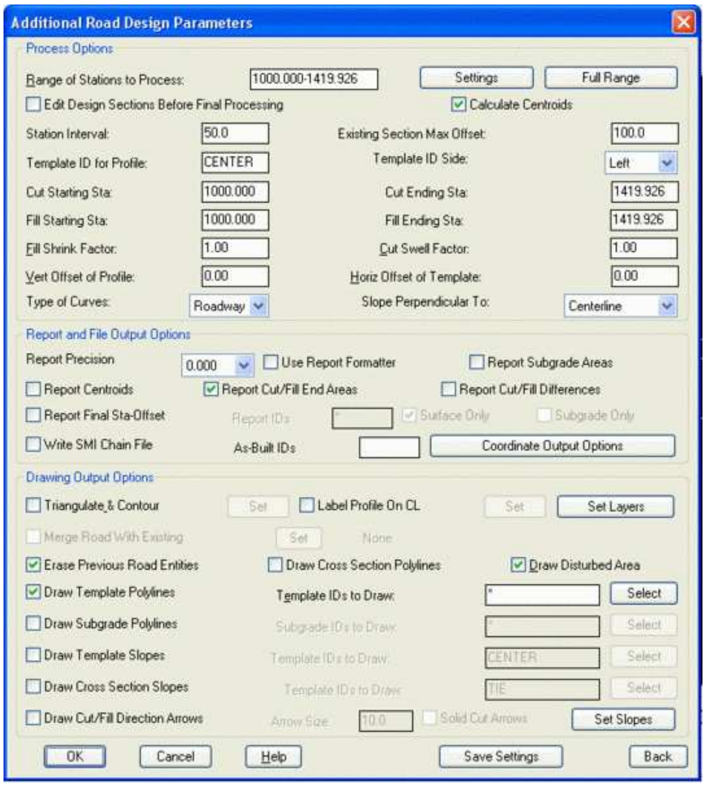
The mass haul diagram can be output as a profile file and shows the cumulative cut and fill along the selected range of stations. Cut and fill is balanced between points on the mass haul profile that cross the Z-axis. Because of the typically large values of cut and fill associated with road and earthwork projects, the vertical scale for the profile may need to be set to 10 times the horizontal scale, or more. The profile preview screen which appears when you select profile for loading will show the elevation range and help suggest an appropriate vertical scale.

19> Super Elevation Diagram File

This option writes out a super elevation transition file (.SUD) that can be used with the Draw Super Elevation Diagram routine. This file contains the template cross slopes and the transition stations.

Running the Road Design Job

After setting up the files and options in the first dialog click the OK button. The next dialog shown below has processing options.



Range of Stations to Process: 1000.000-1419.926

☐ Edit Design Sections Before Final Processing

☑ Calculate Centroids

Station Interval: 50.0

Existing Section Max Offset: 100.0

Template ID for Profile: CENTER

Template ID Side: Left

Cut Starting Sta: 1000.000

Cut Ending Sta: 1419.926

Fill Starting Sta: 1000.000

Fill Ending Sta: 1419.926

Fill Shrink Factor: 1.00

Cut Swell Factor: 1.00

Vert Offset of Profile: 0.00

Horiz Offset of Template: 0.00

Type of Curves: Roadway

Slope Perpendicular To: Centerline

Report Precision 0.000

☐ Use Report Formatter

☐ Report Subgrade Areas

☐ Report Centroids

☑ Report Cut/Fill End Areas

☐ Report Cut/Fill Differences

☐ Report Final Sta-Offset

Report IDs *

☑ Surface Only

☐ Subgrade Only

☐ Write SMI Chain File

As-Built IDs

☐ Triangulate & Contour

☐ Label Profile On CL

☐ Merge Road With Existing

None

☑ Erase Previous Road Entities

☐ Draw Cross Section Polylines

☑ Draw Disturbed Area

☑ Draw Template Polylines

Template IDs to Draw: *

☐ Draw Subgrade Polylines

Subgrade IDs to Draw: *

☐ Draw Template Slopes

Template IDs to Draw: CENTER

☐ Draw Cross Section Slopes

Template IDs to Draw: TIE

☐ Draw Cut/Fill Direction Arrows

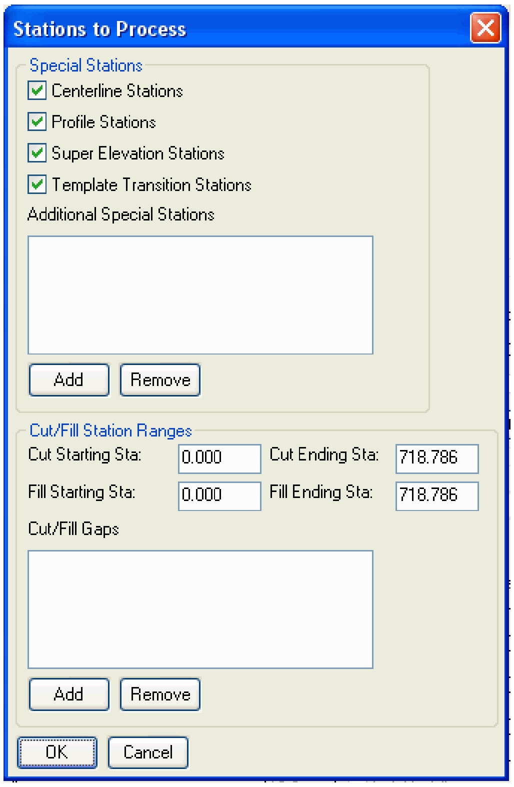
Arrow Size 10.0

☐ Solid Cut Arrows

In the **Process Options** section, the *Range of Stations to Process* field sets the range of station that you want to calculate. Each time you use this command, the existing grade (.SCT) file is scanned and the range in the edit box is set to the minimum and maximum stations in the file. If you change the station range, you can click the *Full Range* button to restore the default full range of stations.

The *Settings* button will interpolate additional existing cross sections (internally) and create final cross sections at special stations like profile high and low points, profile transition stations for PVC and PVT, key centerline points like PC's and PT's, and superelevation and template transition points and any user-defined special stations. These additional station improve volume calculations.

Volumes are calculated using end areas between the range of stations. Also under the *Settings* button, there are controls for the cut/fill starting and ending stations. Instead of cutting off the volumes exactly at this range, the Ending and Starting Stations for Cut and Fill can be used to have the volume taper from zero at the specified Starting Station to the volume at the first station in the range. Likewise the Ending Stations can be used to taper the volume from the last station in the range to zero at the specified Ending Station. You can also specify cut/fill gaps to stop the end area volume calculations over the station range of that gap. This applies in cases like a bridge.


Stations to Process

Special Stations

☑ Centerline Stations

☑ Profile Stations

☑ Super Elevation Stations

☑ Template Transition Stations

Additional Special Stations

Cut/Fill Station Ranges

Cut Starting Sta: 0.000

Cut Ending Sta: 718.786

Fill Starting Sta: 0.000

Fill Ending Sta: 718.786

Cut/Fill Gaps

The *Edit Design Sections Before Final Processing* does just that. You can review and edit the final sections in the spreadsheet with graphic view editor similar to the Input-Edit Section File command. For example, you can change the tie slope as selected stations. After making these changes, the modified final sections are used for the rest of the road design process including earthworks and drawing output.

The *Station Interval* and *Existing Section Max Offset* buttons are ghosted if the existing surface is a set of cross sections. If there is no existing surface, or the existing surface is a grid, TIN or FLT file, then you must enter the Station Interval to generate sections along the centerline. Besides the stations at interval, sections can be created at special stations as specified under the Settings button. The *Existing Section Max Offset* controls the max left and right offsets for generating the existing sections when the Existing Surface is defined by a triangulation file. This offset needs to be set far enough for the final sections outslopes to tie into existing. On the other hand, keeping this offset fairly close to the tie point will help make processing run faster.

The *Calculate Centroid* option applies to centerlines containing curves. The centroids of the cuts and fills will be computed, and the radius to these centroids will be calculated. Then the effective interval will be computed between cut and fill centroids. In this way, in a tight curve where fill is concentrated to the outside of the curve and cut is concentrated to the inside of the curve, fill will be increased and cut will be reduced. This also increases the accuracy of volume calculations.

The *Use Takeoff Strata* option uses the strata surfaces created in the Takeoff module to report the strata cut volumes both for the total strata volumes and the strata end areas per station. This method allows for unlimited strata definitions with advanced modeling techniques including Kriging and Inverse Distance to model strata surfaces. In Takeoff, the Drillhole/Strata Settings command is where you define the strata names and modeling methods. Next, the Place Drillhole command creates the drillholes. Once the drillholes are entered, use the Make Strata Surfaces command to build the strata surfaces which are stored as TIN files and associated with the current drawing.

The *Template ID for Profile* allows the profile grade to be applied to another template ID point other than the centerline. This feature might apply, for example, to a 2-lane road that will eventually be part of a 4-lane road being built in stages. The first-stage, 2-lane road would be fully symmetrical and designed around the crown of the road, but the template profile might be one of the edge of pavements. You can specify the template ID (e.g. EP), and whether the left or right side ID should be used to apply the profile grade.

The *Shrink* and *Swell Factor* edit boxes allow you to specify a value that the volume calculated will be multiplied by. If you specify any number other than one an additional report showing accumulated adjusted volumes and differences will be produced.

The *Vertical Offset of Profile* edit box will place the template at the profile grade as raised or lowered by the entered offset. The *Horizontal Offset of Template* will shift the template left or right on the centerline by the specified amount. Use a positive value to offset to the right and use a negative value to offset left. This option is useful, for example, when one side of a divided highway is built years before the other side is to be started. In this case, you could define a normal template with a crown in the middle, but would enter a horizontal offset from the crown of the road to the actual centerline of the divided highway.

The *Slope Perpendicular To* option defines the slope projection method. The centerline method creates the template cut/fill slopes perpendicular to the centerline. The Slope Direction method accounts for the slope of the profile and makes the final surface to match the template cut/fill slope. For example, if the profile is at a 10% slope and the fill slope is at 2:1, then the Centerline method would create fill slopes that are 2:1 perpendicular to the centerline while slightly steeper (1.96:1) for the actual slope that goes in the slope direction with the effect of the profile. For the same case except with the Slope Direction method, the resulting slope perpendicular to the centerline is less steep (2.04:1) while the actual slope in the slope direction is exactly 2:1.

The **Report and File Output Options** include settings for reporting final coordinates (if specified in the previous file output dialog), as well as special features.

The *Report Precision* controls the number of decimal places.

The *Use Report Formatter* option allows you to customize the fields to report and their order. It also can output the report to MS Excel or databases.

The *Report Subgrade Areas* option will include an additional line in the report for the end area of each subgrade material.

The *Report Centroids* toggle controls whether the shift in the cut or fill centroid radius shift will be included in the earthworks report.

The *Report Cut/Fill Text* option greatly expands the size of the report by presenting the cut and fill end areas at each station. A sample of the cut/fill text report is shown below. Volumes by end area method are presented between each line containing station and end areas of cut, fill and optionally rock.

```
Station    Cut(sf)   Fill(sf)  Rock(sf)  Interval   Cut(cy)   Fill(cy)   Rock(cy)
3+00.00    0.00      101.07    0.00
                                         50.00      313.78     93.58      0.00
3+50.00    338.88    0.00      0.00
                                          6.09       80.93      0.00      0.00
3+56.09    379.10    0.00      0.03
                                         43.91      824.60      0.00     31.84
4+00.00    634.92    0.00     39.12
```

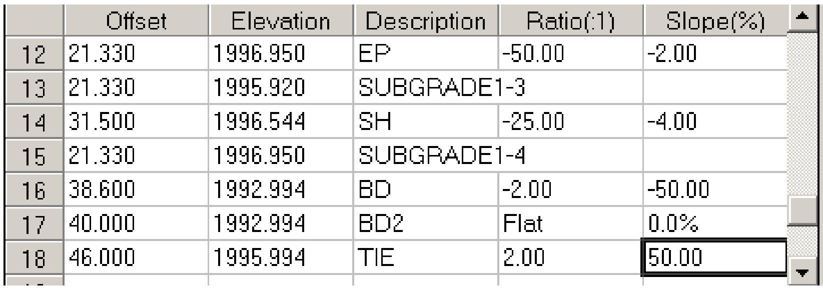
The *Report Cut/Fill Differences* option will report the cut/fill ratio and balance at each station.

The *Report Cumulative Cut/Fill Differences* option will report the running totals of cut/fill at each station.

The *Report Final Station-Offset* option will create a report of the final section offset-elevation data in row-column format. The station and profile grade are shown on the left followed by columns of offset and elevation for each data point. There are options to report the surface points only, the subgrade points only or filter the points by ID.

Write SMI Chain File creates a chain (.CH) file that contains the centerline, profile and template data for SMI Construction V.

The *As-Built IDs to Use* option applies only if you have specified an as-built section file as one of the inputs in the previous dialog. Consider a normal road template with 20 feet to edge of pavement (EP) and 10 feet more to shoulder (SH). Going further, assume that when you run this template, it does a fill condition on the right and creates a TIE point. If you wanted to conform the template to match a wider section of road at certain stations, you could edit the output file of a normal run (using Input-Edit Section File) and create new offsets and subgrade points for widening and even force a trapezoidal ditch in cut, as shown in the entries below:



	Offset	Elevation	Description	Ratio(:1)	Slope(%)
12	21.330	1996.950	EP	-50.00	-2.00
13	21.330	1995.920	SUBGRADE1-3		
14	31.500	1996.544	SH	-25.00	-4.00
15	21.330	1996.950	SUBGRADE1-4		
16	38.600	1992.994	BD	-2.00	-50.00
17	40.000	1992.994	BD2	Flat	0.0%
18	46.000	1995.994	TIE	2.00	50.00

Because all the other offsets to the left match by default, this editing will force the template to conform from offsets 21.33 right to the tie at 46 right. As you try different design template or other changes in *Process Road Design*, this as-built information would hold for the specified station. Alternately, you could edit the final cross section directly in *Input-Edit Section File*. Note that you can use distinct, new ID points like BD2 which are not found in the template file, and they will be created if part of the as-built cross section file, and if referenced as *As-Built IDs to Use*. This As-Built method works best when inserting controlled section defined from TIE left to TIE right, which get inserted as completed sections in a run of Process Road Design.

The *Output CRD File* options apply when a Output Coordinate File is specified in the first dialog. These options allow you to output any combination of template surface, subgrade, ditch and berm points. The *Output CRD To Use Sta-Off Desc* option sets whether to include the station and offset in the description for each point. Here are example coordinates for station 0+90:

```
PtNo. North(y)  East(x)   Elev(z)  Description
 122  189497.42 611730.32 90.01    TIE 0+90.00L53.65
 123  189461.43 611733.72 108.09   SHD 0+90.00L17.50
 124  189457.45 611734.09 107.93   CURB3 0+90.00L13.50
 125  189456.95 611734.14 107.93   CURB2 0+90.00L13.00
```

```
126  189456.95 611734.14 107.09   CURB1 0+90.00L13.00
127  189455.96 611734.23 107.09   EP 0+90.00L12.00
128  189444.01 611735.36 107.33   CENTER 0+90.00R0.00
129  189432.06 611736.49 107.09   EP 0+90.00R12.00
130  189431.07 611736.58 107.09   CURB1 0+90.00R13.00
131  189431.07 611736.58 107.93   CURB2 0+90.00R13.00
132  189430.57 611736.63 107.93   CURB3 0+90.00R13.50
133  189426.59 611737.00 108.09   SHD 0+90.00R17.50
134  189412.18 611738.36 100.85   TIE 0+90.00R31.97
```

The **Drawing Output Options** bottom section of the Additional Earthworks Parameters dialog contains output options which are only available when a centerline file is specified.

The *Triangulate & Contour* option will automatically run this command after Process Road Design is done to create the final contours. Triangulate & Contour uses the template 3D polylines to model the final surface, and the disturbed area polyline is used as the inclusion perimeter for the contours. With Triangulate & Contour clicked on, the *Setup* button becomes active. Picking Setup brings up the Triangulate & Contour settings including the contour interval and whether to draw 3D Faces. Also under Setup, there are controls for the colors of the 3D Faces for each template break point. With Triangulate & Contour active, Draw Template Polylines and Draw Disturbed Area Polyline are automatically turned on. The *Merge Road With Existing* option combines the road design triangulation with the existing ground surface and stores the resulting triangulation in the file specified with the Set button. This option is available when the Existing Surface is a triangulation file and the Triangulate & Contour option is active.

The *Erase Previous Road Entities* option will erase any entities from the drawing that were created in a previous run of Process Road Design using the same design files. This option allows you to easily re-run Process Road Design and update the drawing entities after changing one of the road design files.

The *Draw Cross Section Polylines* option will create 3D polylines perpendicular to the centerline with each template break point. The interval of these cross section polylines is determined by the station interval of the Existing Sections.

The *Draw Template Polylines* option will create 3D polylines parallel to the centerline by connecting common template point IDs. For example, a template ID could be EP which this option would use to create 3D polylines for EP on the left and right of the centerline. Which template point IDs to connect in set under *Template IDs to Draw*. Setting this to an asterick (∗) will plot all the template break points. The *Select* button shows cross sections of the final templates for graphical selection of the ID's to draw.

Likewise, the *Draw Subgrade Polylines* option will create 3D polylines parallel to the centerline for the specified subgrade breakpoints.

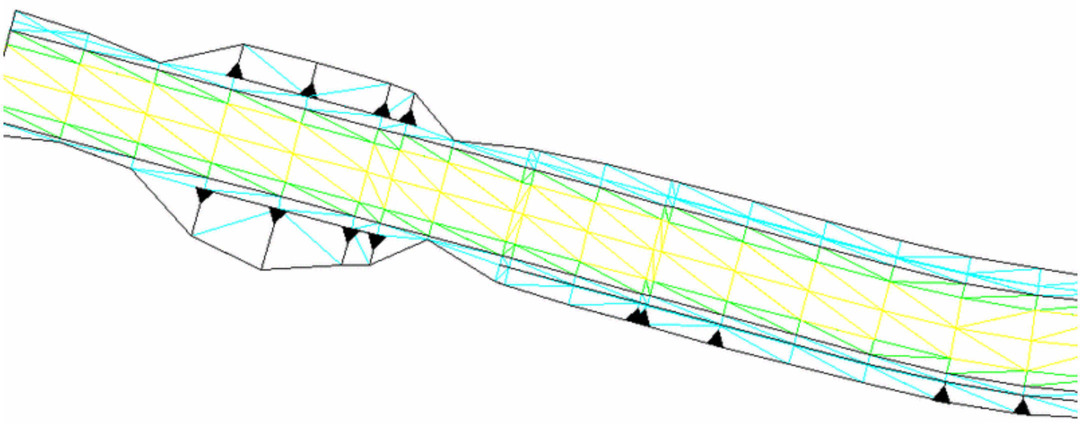
The *Draw Disturbed Area Polyline* option will create a polyline perimeter that represents where the cut/fill slopes tie into the existing ground.

Draw Template Slopes creates slope arrows parallel to the centerline at the specified template ID's. For example, this option can be used to show the slope direction and amounts along the template flowline. The style of the slope arrows is set under the *Set Slopes* button at the bottom of the dialog.

Draw Cross Section Slopes create slope arrows perpendicular to the centerline at the specified template ID's. For example, use this option to show the cross section slope of the pavement lanes. The cross section interval is controlled by the station interval under Process Options. The style of the slope arrows is set under the *Set Slopes* button at the bottom of the dialog.

Label Profile On Centerline creates labels in plan view for the profile stations, elevations and slopes as well as high and low points. This option has the same functionality as the command by the same name in the Profiles menu.

The *Draw Cut/Fill Direction Arrows* option will draw arrow indicators for cut or fill slope direction. The arrows are drawn in plan view and usually are drawn together with the Draw Disturbed Area and Draw Cross Section Plines options. Cut arrows start from the disturbed area limit and point towards the centerline. Fill arrows start from the base of the fill slope and point away from the centerline. The *Solid Cut Arrows* option chooses between solid fill or wire-frame cut arrows. These arrows, especially when drawn as solid cut arrows, help distinguish cut and fill at a glance, when in plan view. In the example below, fill from a berm is shown at the left and cut down to a ditch is shown at the right. The arrows will only draw if there is enough dimension in the cut and fill to fit the entire arrow. So the cut and fill arrows reveal the deeper cut and fill zones.



Prompts

Road Design Files dialog: Choose the design files
Additional Road Design Parameters
Road Design Report dialog
Trim existing contours inside disturbed area (Yes/<No>)? *Y* This prompt appears if Triangulate & Contour is on. This option will trim polylines with elevation that cross the disturbed area perimeter for the road.
Join final contours with existing (<Yes>/No)? *Y* This prompt appears if Triangulate & Contour is on. This option will join the final contours with the existing contours where they join at the disturbed area perimeter.

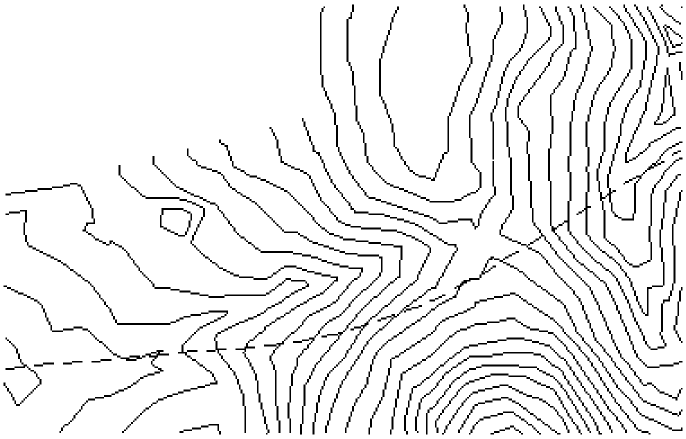
Portion of Earthworks Report:

```
Template File> C:\DATA\simo2.tpl
Profile File> C:\DATA\rd.pro
Existing Section File> C:\DATA\simo2.sct
Centerline File> C:\DATA\simo2.cl

Processing 0+25.000 to 7+51.152
Total Cut : 800563.177 C.F., 29650.488 C.Y.
Total Fill: 1554948.266 C.F., 57590.677 C.Y.

Station   Cut(sf)    Fill(sf) Interval  Cut(cy)    Fill(cy)
0+25.000 4407.456   0.000
                             25.000    4784.266   0.000

0+50.000 5926.559   0.000
                             25.000    5535.921   0.000

0+75.000 6031.029   0.000
                             25.000    4840.888   0.000

1+00.000 4425.290   0.000
                             25.000    3432.528   0.000
```

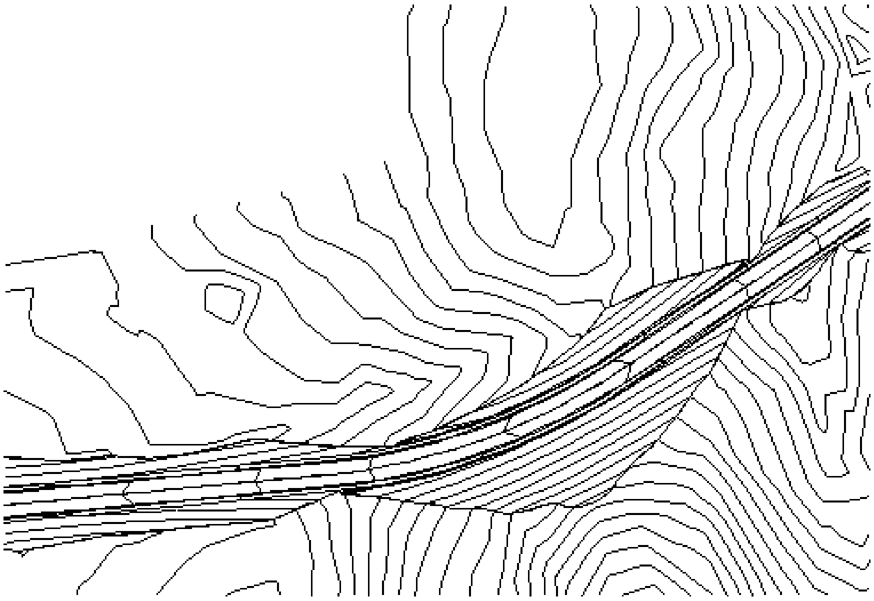
```
1+25.000 2988.971  0.000
                           25.000    2713.262  3.362
1+50.000 2871.676  7.262
```

Portion of Final Station-Offset Report:

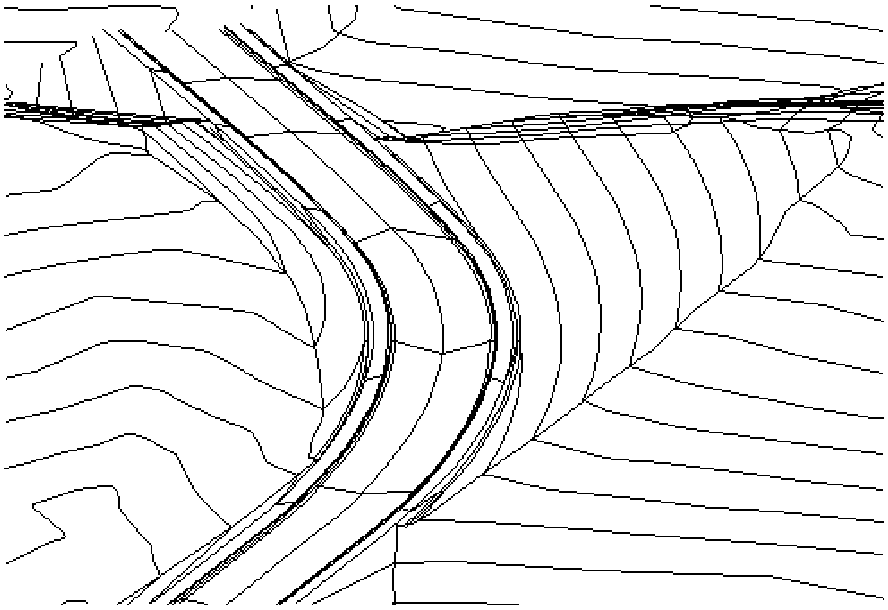
```
Final Surface Section Report
STATION      P.G.
2+50.000     1013.444 59.619 18.000 12.000 0.000 12.000
             992.634 1013.444 1013.204 1013.444 1013.204
2+75.000     1015.059 65.772 18.000 12.000 0.000 12.000
             991.173 1015.059 1014.819 1015.059 1014.819
3+00.000     1016.499 71.547 18.000 12.000 0.000 12.000
             989.725 1016.499 1016.259 1016.499 1016.259
3+25.000     1017.764 76.733 18.000 12.000 0.000 12.000
             988.398 1017.764 1017.524 1017.764 1017.524
```



Existing Contours and Centerline



3D template polylines, disturbed area perimeter polyline and final contours



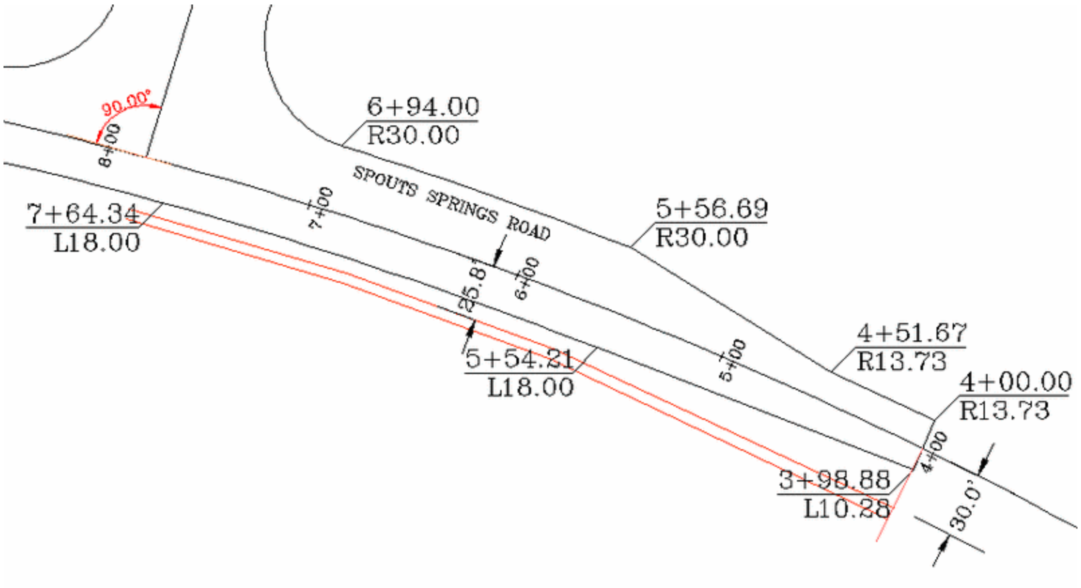
Template polylines and final contours viewed in 3D using Viewpoint 3D command

Review of 3 Methods of Transitioning Templates using Process Road Design

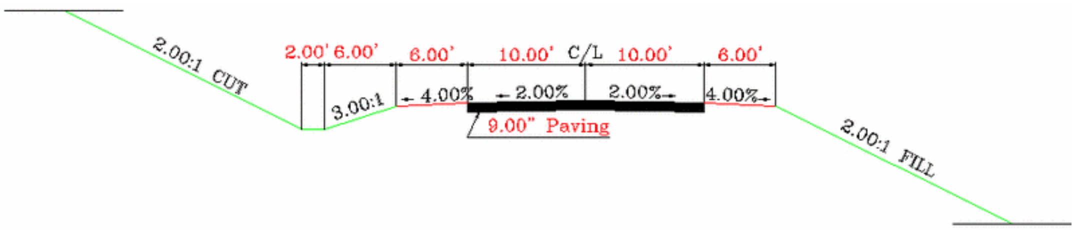
The 3 methods of template transitions and super elevation are:
(1) Template Transition and/or Super Elevation Files
(2) Template Point Profile and Template Point Centerline files
(3) Template Series file which transitions between multiple, named templates.

Road widening and lane transitions can be handled by all 3 methods. Special ditches are best handled by method (2), Template Point Profile and Template Point Centerline, especially since Template Transition files only work with lanes or portions of roads defined by the Grade button in Design Template. Template Transition files do not apply to cut and fill segments, unless they are designed as fixed features using the Grade button. Super elevation can often be handled by method (1) or method (3). Bear in mind that new lanes or template elements that emerge and then disappear need to exist as template ID points in all referenced templates, using all 3 methods. These template ID points can be set to 0.001 units from adjacent template points, then "told" to emerge and widen as new lanes with distinct slopes appear. The program will not transition templates that don't share common template ID points.

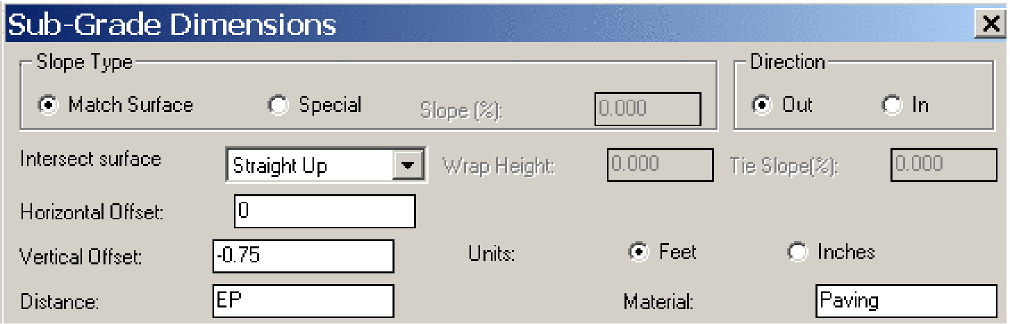
This deceptively easy looking example below might be approached by a combination of methods 1 and 2. For method 1 to apply (template transition), the slopes of the pavement lanes must be maintained according to the template definition from centerline to outside lane. The ditch portion will be handled by method 2 (template point centerline).


90.00°
8+00
6+94.00
R30.00
SPOUTS SPRINGS ROAD
7+00
7+64.34
L18.00
5+56.69
R30.00
25.8'
6+00
5+54.21
L18.00
5+00
4+51.67
R13.73
4+00.00
R13.73
4+00
3+98.88
L10.28
30.0'

Assume Spouts Springs Road is a hillside road with a ditch cut on the left side and fill on the right side. The trapezoidal ditch is shown. We will design only from station 4+00 to station 6+94 where the intersection begins. The standard template of 10' left lane and 10' right lane might appear as shown below:


2.00:1 CUT
2.00'
6.00'
6.00'
10.00'
C/L
10.00'
6.00'
3.00:1
4.00%
2.00%
2.00%
4.00%
9.00" Paving
2.00:1 FILL

Note that if lanes are designed to expand, its important that the subgrade (9" of paving, shown above) be defined as following the ID, and should not be set to a fixed distance. The "EP" ID is used in the dialog below (top of subgrade dialog within Design Template) for this example.



Sub-Grade Dimensions

Slope Type

● Match Surface ○ Special Slope (%): 0.000

Direction

● Out ○ In

Intersect surface: Straight Up

Wrap Height: 0.000

Tie Slope(%): 0.000

Horizontal Offset: 0

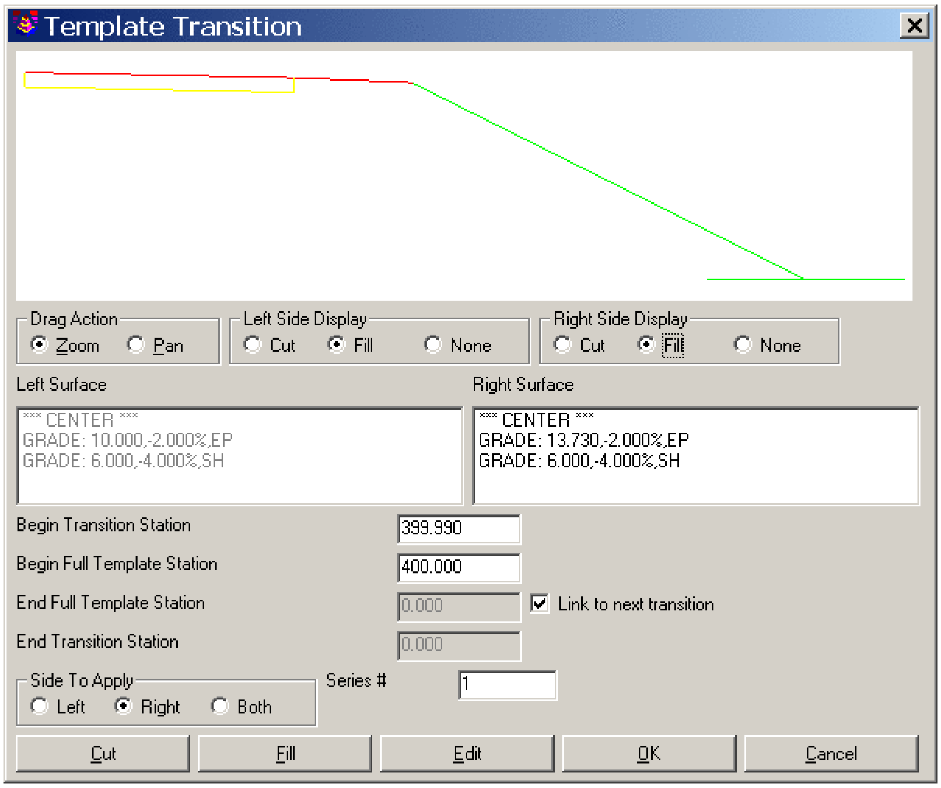
Vertical Offset: -0.75

Units: ● Feet ○ Inches

Distance: EP

Material: Paving

The right hand portion of this example would be entered as follows:


Template Transition

Drag Action: ● Zoom ○ Pan

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ○ Cut ● Fill ○ None

Left Surface

*** CENTER ***
GRADE: 10.000,-2.000%,EP
GRADE: 6.000,-4.000%,SH

Right Surface

*** CENTER ***
GRADE: 13.730,-2.000%,EP
GRADE: 6.000,-4.000%,SH

Begin Transition Station: 399.990

Begin Full Template Station: 400.000

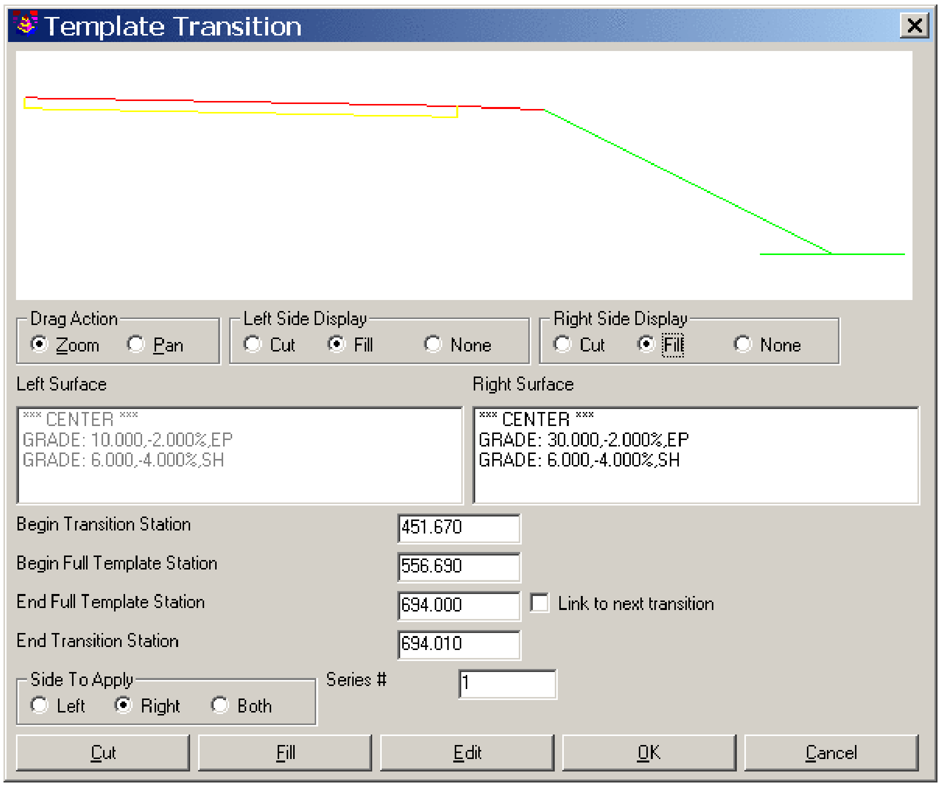
End Full Template Station: 0.000 ☑ Link to next transition

End Transition Station: 0.000

Side To Apply: ○ Left ● Right ○ Both

Series #: 1

When you click "Add" within the Template Transition main dialog, you are presented with the above screen. Template transitions require that you specify the correct side of the road in the lower left, then click the Grade or lane to alter, which is the first lane on the right, which is set to 13.73 according to the plans. To make sure the lane is fully expanded from the standard 12 to the 13.73 at station 400, it is necessary to set the "Begin Transition Station" to something less than 400, as shown. Then if this "expanded" lane width does not transition back to standard 12 width, but changes again, you must click on "Link to next transition" and leave the "End Full Template" and "End Transition" stations blank. Then you click "Add" again for the final segment, which would be entered as shown:


Template Transition

Drag Action: ● Zoom ○ Pan

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ○ Cut ● Fill ○ None

Left Surface

*** CENTER ***
GRADE: 10.000,-2.000%,EP
GRADE: 6.000,-4.000%,SH

Right Surface

*** CENTER ***
GRADE: 30.000,-2.000%,EP
GRADE: 6.000,-4.000%,SH

Begin Transition Station: 451.670

Begin Full Template Station: 556.690

End Full Template Station: 694.000 ☐ Link to next transition

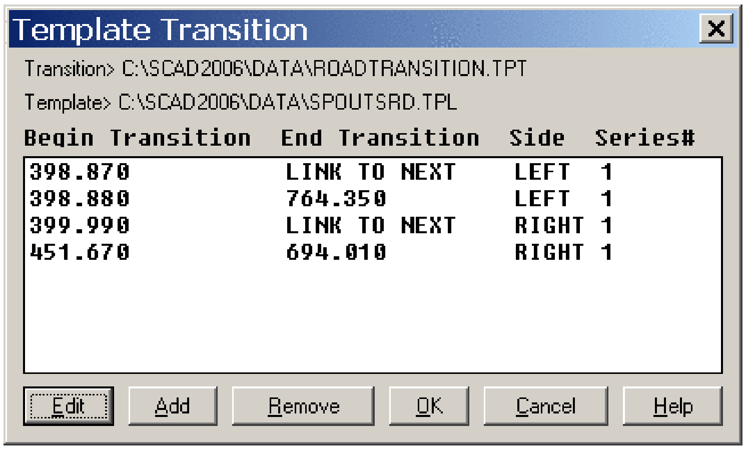
End Transition Station: 694.010

Side To Apply: ○ Left ● Right ○ Both

Series #: 1

First, you specify "Side to Apply" as "Right", then click the pavement lane and edit it to 30', as shown above. Referencing the plan view drawing for Spouts Road shown above, you transition from station 451.67 to the new 30' road lane width at station 556.69 and hold that to the "End Full Template Station", which is 694.00. Then you can enter an "End Transition Station" just past the end of the key station range, which internally would transition the template back to a standard width of 12' at 694.01 (a moot point as the end of the project is station 694 for this exercise). The key to template transition is that it is designed to transition from normal to expanded or reduced dimension, then transition back to normal. It is ideal for use in passing lanes that appear and then transition back, but requires use of "Link to next transition" to handle a sequence of lane width changes as above. Therefore, where lane widths change often, and don't transition back to the normal template lane width, it is often best to use Template Point Centerline as the method of lane transitioning. We will apply that below to the ditch line.

When the template transition process is repeated for the left driving lane, you obtain a final Template Transition dialog as shown here:



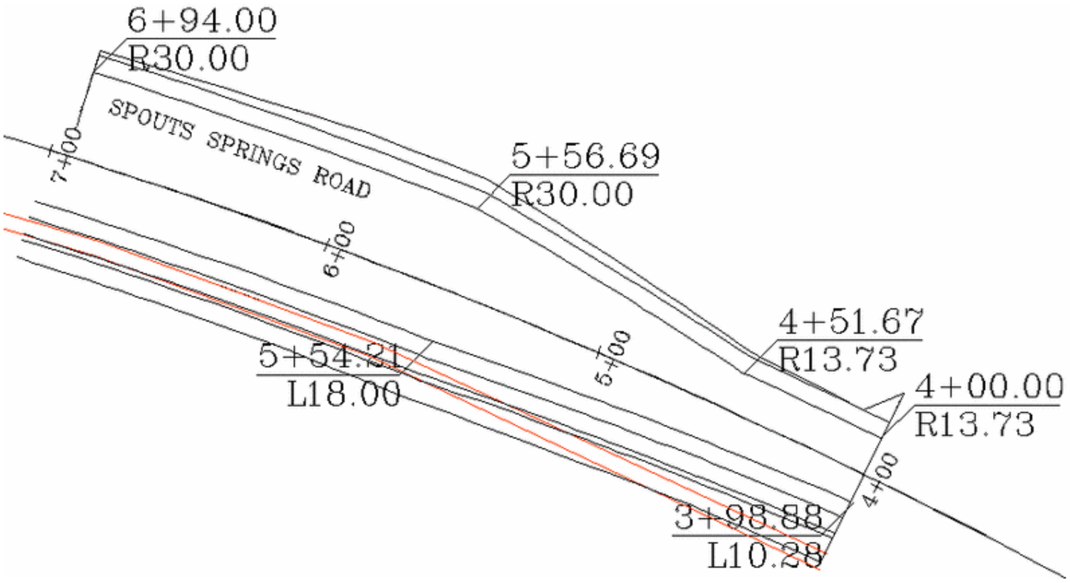
Template Transition

Transition> C:\SCAD2006\DATA\ROADTRANSITION.TPT

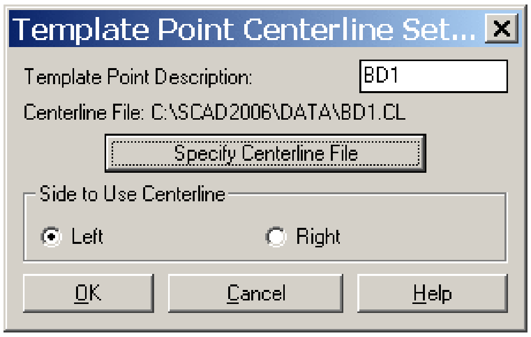
Template> C:\SCAD2006\DATA\SPOUTSRD.TPL

Begin Transition	End Transition	Side	Series#
398.870	LINK TO NEXT	LEFT	1
398.880	764.350	LEFT	1
399.990	LINK TO NEXT	RIGHT	1
451.670	694.010	RIGHT	1

For the left side, the first screen just starts things up by establishing 10.28 as starting left side dimension, then the "Link to next transition" option is used, and the width of 18 is entered, transitioning to 18 at station 554.21 and holding that to an end station of 764.34, transitioning "back" to 12 at the fictitious 764.35, well beyond the 400 to 694 station range of interest. When this template transition file is run in Process Road Design and Triangulate & Contour is turned on within Process Road Design, the output clearly shows that the lane transitions have followed the lane expansions correctly:



However, it is easy to see that the "design ditch" on the left side of the road, at 2' wide, did not conform to the special ditch which hugs the shoulder at station 7+00 but transitions to further off of the shoulder at 4+00. This special ditch is best handled with Template Point Centerline. To complete the special ditch design, use Polyline to Centerline File on both ditch polylines, calling the inside polyline BD1.CL and the outside polyline BD2.CL, as a reference to the ditch IDs, BD1 and BD2. You can give them a starting station of 0. The stationing of the ditch polyline does not matter, since only the coordinates of the centerline in the command Assign Template Point Centerline are used to determine the template ID position. Within Assign Template Point Centerline, Add each of the ditch sides as shown:


Template Point Centerline Set...

Template Point Description: BD1

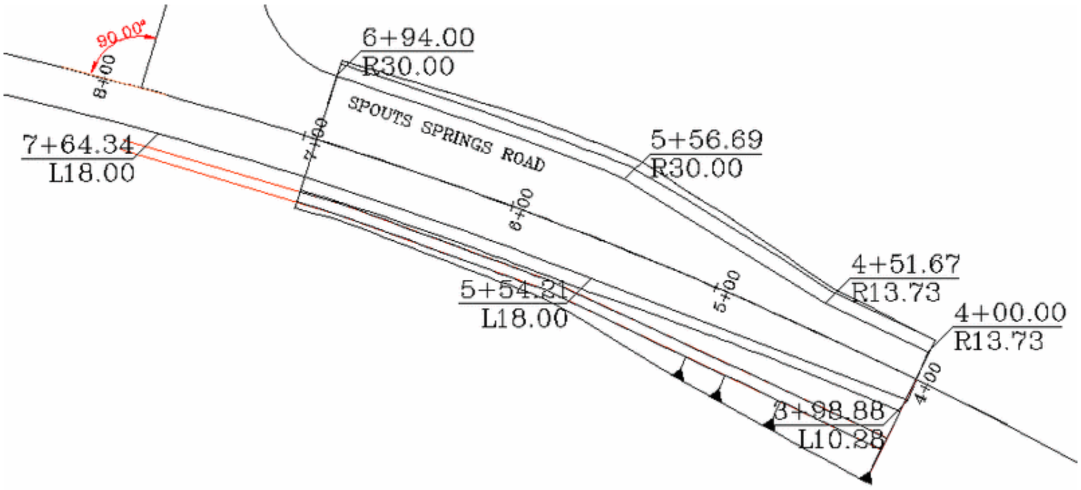
Centerline File: C:\SCAD2006\DATA\BD1.CL

Side to Use Centerline

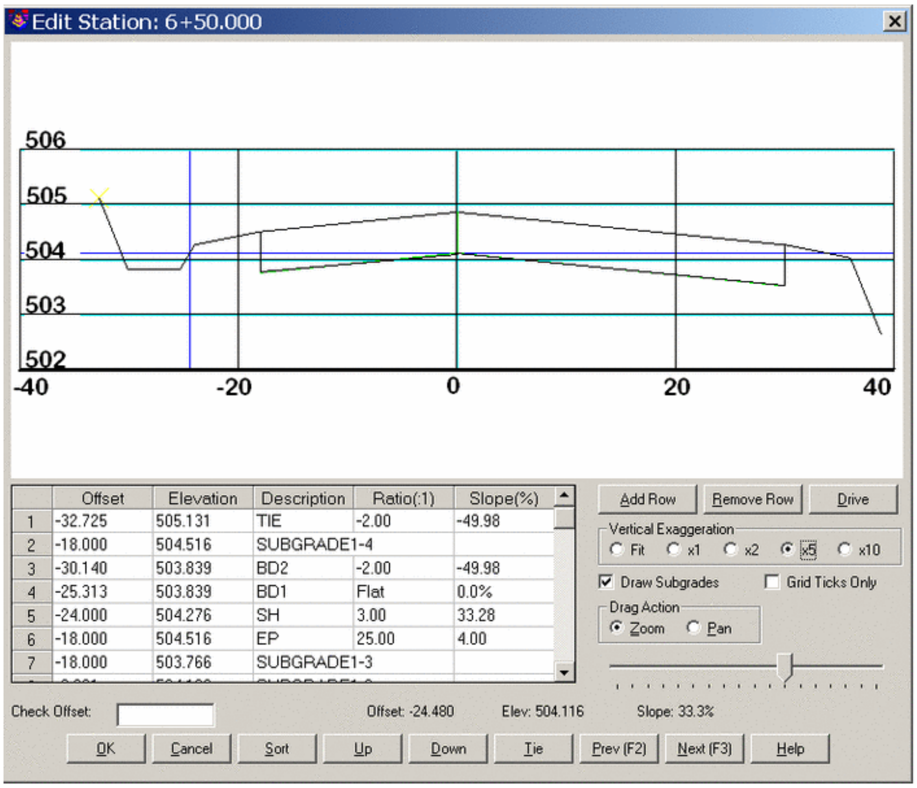
● Left ○ Right
Specify Centerline File
OK
Cancel
Help

Note that if the ditch always exists on the left side, the ditch grades can be defined using the Grade button in Design Template, rather than using the Ditch feature within the Cut button. For final results, run the Process Road Design command using a combination of the Template Transition File and the Template Point Profile.

The end result is a final drawing that uses the Template Transition file to create the correct edge of pavement and uses the Template Point Centerline file to track along the correct ditch polylines. This is shown below in the final drawing of the 3D polylines generated by Process Road Design:


90.00°
8+00
6+94.00
R30.00
7+64.34
L18.00
7+00
SPOUTS SPRINGS ROAD
5+56.69
R30.00
6+00
5+54.21
L18.00
5+00
4+51.67
R13.73
4+00.00
R13.73
4+00
3+98.88
L10.88

The actual slope to the ditch on the left is held at the design of 3:1, or whatever exists within the template from shoulder (SH) to base of ditch (BD1) in cut. Shown below in the Input-Edit Section File screen editor is station 6+50, where the ditch is designed very close to the shoulder:


Edit Station: 6+50.000
506
505
504
503
502
-40
-20
0
20
40
Add Row
Remove Row
Drive
Vertical Exaggeration
○ Fit ○ x1 ○ x2 ● x5 ○ x10
☑ Draw Subgrades
☐ Grid Ticks Only
Drag Action
● Zoom ○ Pan
OK
Cancel
Sort
Up
Down
Tie
Prev (F2)
Next (F3)
Help

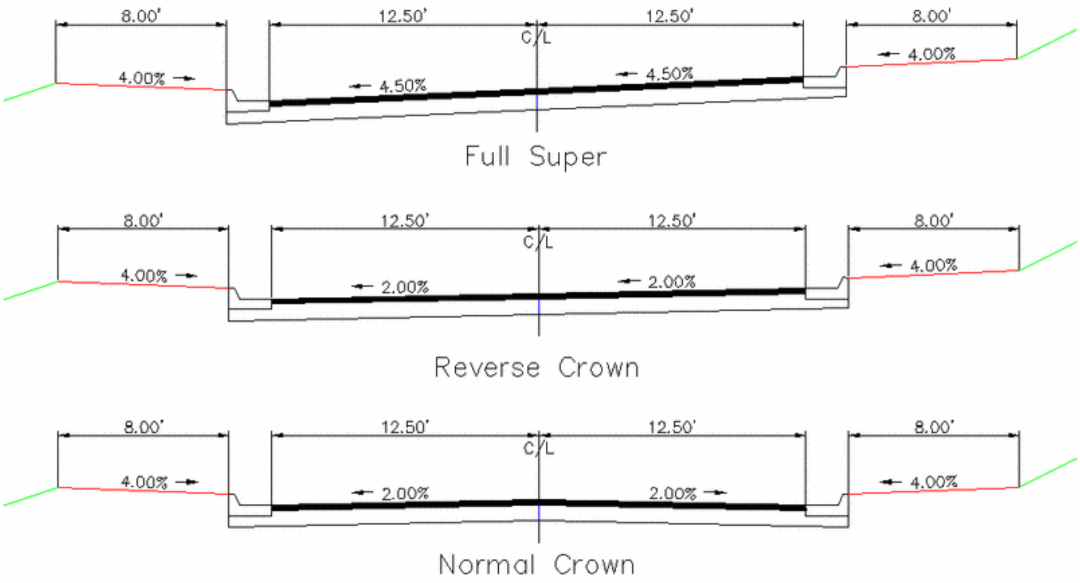
	Offset	Elevation	Description	Ratio(:1)	Slope(%)
1	-32.725	505.131	TIE	-2.00	-49.98
2	-18.000	504.516	SUBGRADE1-4		
3	-30.140	503.839	BD2	-2.00	-49.98
4	-25.313	503.839	BD1	Flat	0.0%
5	-24.000	504.276	SH	3.00	33.28
6	-18.000	504.516	EP	25.00	4.00
7	-18.000	503.766	SUBGRADE1-3		

Check Offset:

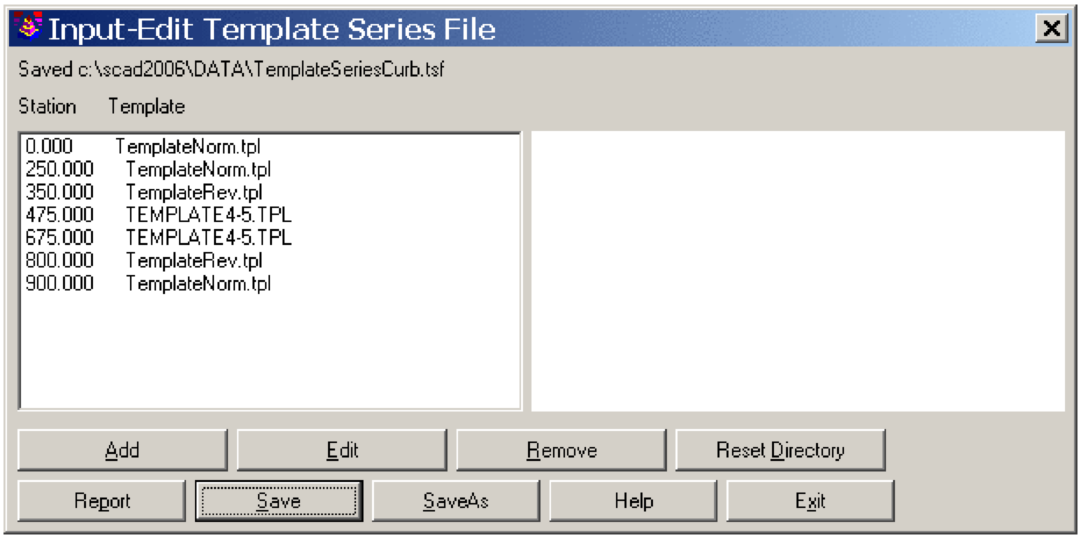
Offset: -24.480 Elev: 504.116 Slope: 33.3%

Note that the distance from BD1 to BD2 is irregular, based entirely on the plan view offset of the ditch polylines. Note also that BD1 to SH is 3:1, holding the defined slope. (The cursor position also can be used to verify slope of any portion of the section in "real-time".) Finally, note that the subgrade follows the widening and irregular position of the pavement lane EP for both left and right sides, since the subgrade offset from centerline was defined as EP.

Although superelevation can be handled by use of superelevation files, for most simple applications (2-lane roads in particular), a single curve with superelevation can be handled by a template series file, using only 3 templates: normal crown, reverse crown, full super. This is illustrated below, for a typical 2-lane road template:


8.00'
12.50'
12.50'
8.00'
C/L
4.00%
4.50%
4.50%
4.00%
Full Super
8.00'
12.50'
12.50'
8.00'
C/L
4.00%
2.00%
2.00%
4.00%
Reverse Crown
8.00'
12.50'
12.50'
8.00'
C/L
4.00%
2.00%
2.00%
4.00%
Normal Crown

The actual Template Series File will consists of 6 entries for one curve: Normal, Reverse, Begin Full Super, End Full Super, Reverse, Normal. You would only need to make one extra template, for simple roads, for every additional curve, for the full super condition, since normal and reverse crown remain the same. Note that the curbs, even on the high side, can be designed to slope downward and catch the shoulder drainage in Design Template by use of "special slope" of -1% in the curb design, or by entering a value for the added "Drop" across the gutter portion. Both methods create a downhill slope to the face of curb. So the above project might be designed as shown below in the Input-Edit Template Series command:



Saved c:\scad2006\DATA\TemplateSeriesCurb.tsf

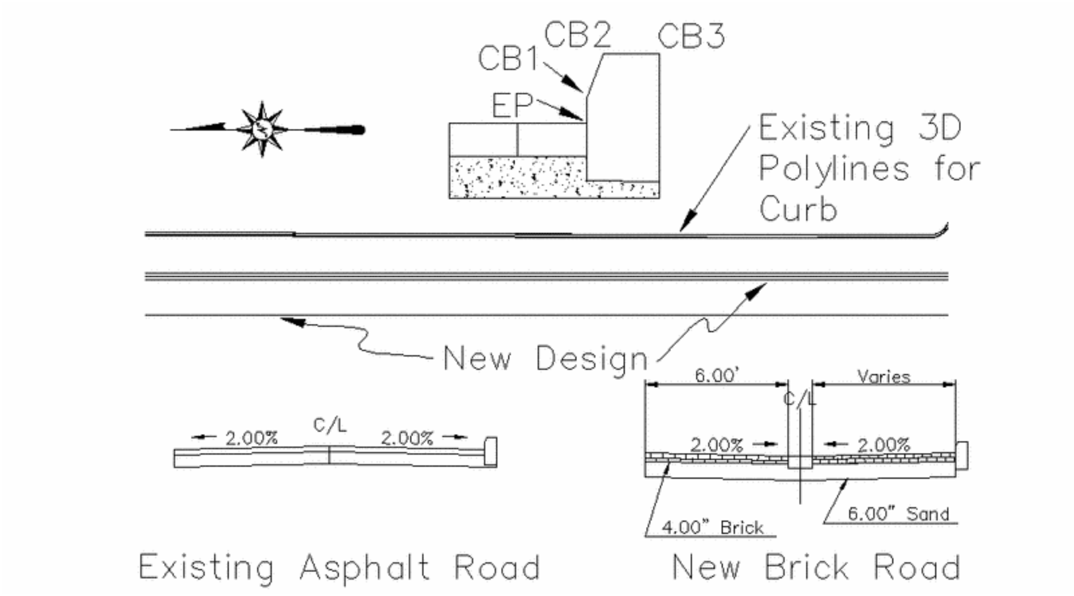
Station	Template
0.000	TemplateNorm.tpl
250.000	TemplateNorm.tpl
350.000	TemplateRev.tpl
475.000	TEMPLATE4-5.TPL
675.000	TEMPLATE4-5.TPL
800.000	TemplateRev.tpl
900.000	TemplateNorm.tpl

Note that beginning and ending stations are not necessary. If station 0.00 was omitted, Process Road Design would use the normal template in any case from station 0 to 250. Similarly, Process Road Design will use the normal template going forward from station 900 automatically.

Review of 2 Methods of Matching Portions of Existing Roads

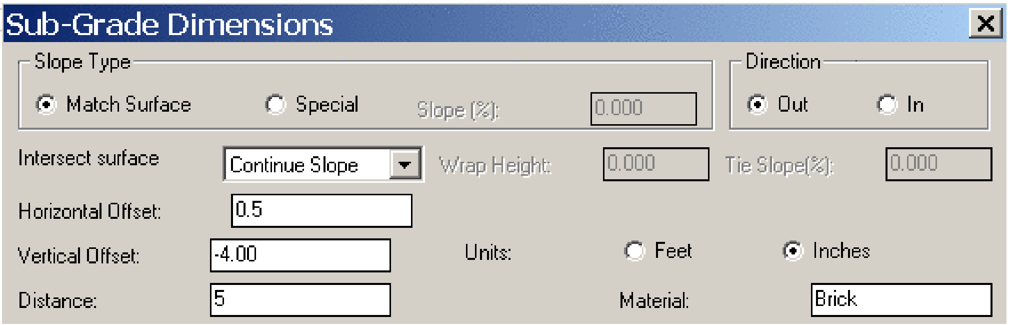
There are two main techniques for tying new template designs into existing roads, which may apply to road expansions, urban re-paving, grade improvements and other renovation projects. As more and more roadwork involves road improvement rather than new road development, these techniques become more useful and critical to master. The two techniques are: (1) Use of Template Point Profile and Template Point Centerline files to match existing conditions on portions of roads that do not change, and (2) Use of the "As-Built" cross section feature as one of the input files. An advantage of the As-Built method is that you can insert section points with special IDs for special features, whereas the Template Point Profile and Template Point Centerline methods must follow template IDs that are found in the original, main template design file. But the Template Point or "string" method allows for calculating sections at any interval, while the As-Built section method will revise final sections only at stations found in the As-Built section file.

Consider this alley-way, which consists of a Belgian block style curb (no gutter) that is already in place. The plans are to remove a crowned asphalt alleyway and put in a bricked alleyway on sand, with a central, "depressed" rock drain of 1' width, to avoid water draining against buildings that abut the alley. But the design must match an existing "Belgian block" style curb on the right side of the road, which will not be removed.



There is a new profile design involved, and a new template. However, the right side of the template will meet the exact grade and offset of the in-place curb, which has been surveyed as back of curb (CB3). Then the command Offset 3D Polyline was used to create the face of curb at EP=CB1, and to create the inside top of curb (CB2). Because of the symmetry and consistency of the curb, only the back of curb needed to be surveyed to hold the existing curb feature in place within Process Road Design. From that survey, the 3D Polyline for the EP is derived, which will be used for Template Point Centerline and Template Point Profile.

Features such as curbs and medians can be designed once within Design Template and then saved as curb or median files, then re-loaded and used in other templates, and applied to the left or right side of the template as desired. The central rock median of 1' total width can be constructed as two subgrades, one on the left side of 0.5' width and one on the right side of 0.5' width. The brick portion can be designed as a 4" thick subgrade as shown below. On the left side, you would need to use the "Straight Up" method of closing the subgrade surface. On the right side, you can use "Continue Slope". When using Continue Slope, it is best to underestimate the length needed to contact the next surface (the right curb), so continue can do an "extend" and find it. If you make the length too long (e.g. 6', which catches the curb which itself tilts back -2%), the program will not trim and will draw the subgrade to the back of the curb. Note that the vertical subgrade depth can be entered as 4 or -4. Both are accepted.



Slope Type: ● Match Surface ○ Special Slope (%): 0.000

Direction: ● Out ○ In

Intersect surface: Continue Slope

Wrap Height: 0.000

Tie Slope(%): 0.000

Horizontal Offset: 0.5

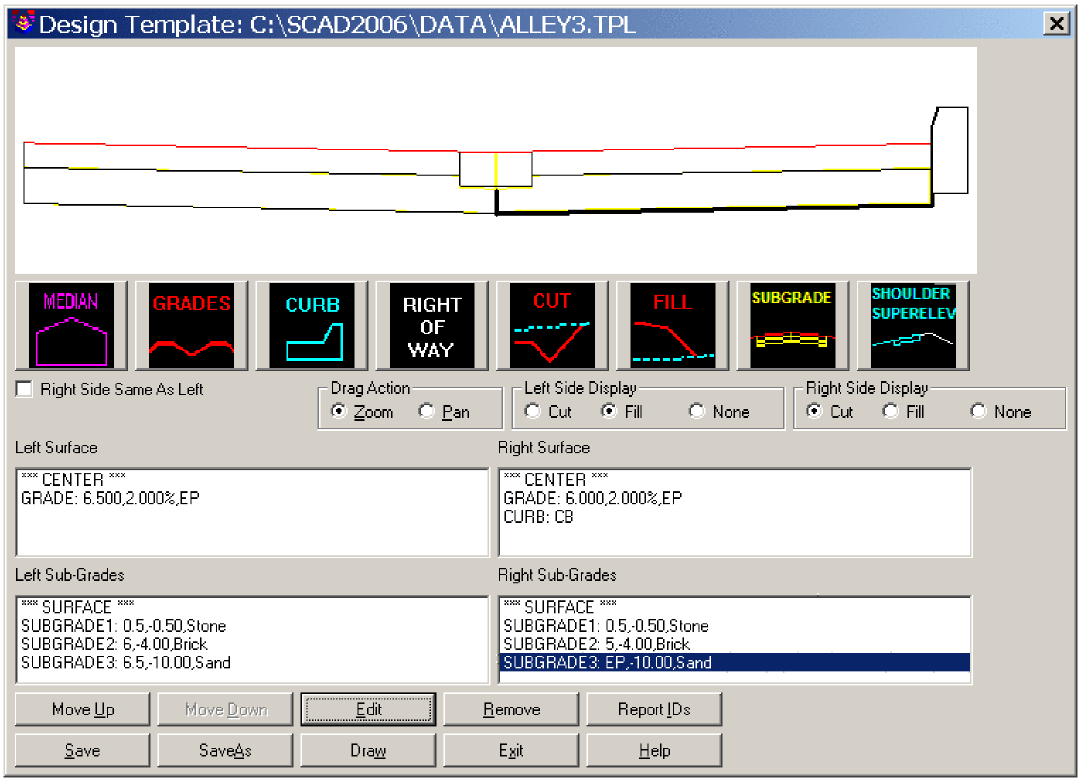
Vertical Offset: -4.00

Units: ○ Feet ● Inches

Distance: 5

Material: Brick

Be sure to define the sand subgrade on the right side (lowest subgrade) to have a distance of EP, a flexible distance that follows the precise offset of the EP "ID", which will be assigned to follow the face of curb template point profile defined by CB1 above.



Design Template: C:\SCAD2006\DATA\ALLEY3.TPL

☐ Right Side Same As Left

Drag Action: ● Zoom ○ Pan

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ● Cut ○ Fill ○ None

Left Surface

```
*** CENTER ***
GRADE: 6.500,2.000%,EP
```

Right Surface

```
*** CENTER ***
GRADE: 6.000,2.000%,EP
CURB: CB
```

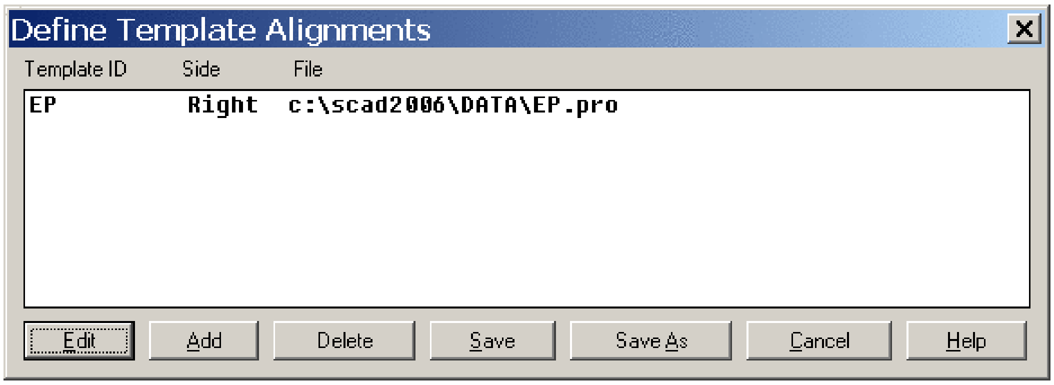
Left Sub-Grades

```
*** SURFACE ***
SUBGRADE1: 0.5,-0.50,Stone
SUBGRADE2: 6,-4.00,Brick
SUBGRADE3: 6.5,-10.00,Sand
```

Right Sub-Grades

```
*** SURFACE ***
SUBGRADE1: 0.5,-0.50,Stone
SUBGRADE2: 5,-4.00,Brick
SUBGRADE3: EP,-10.00,Sand
```

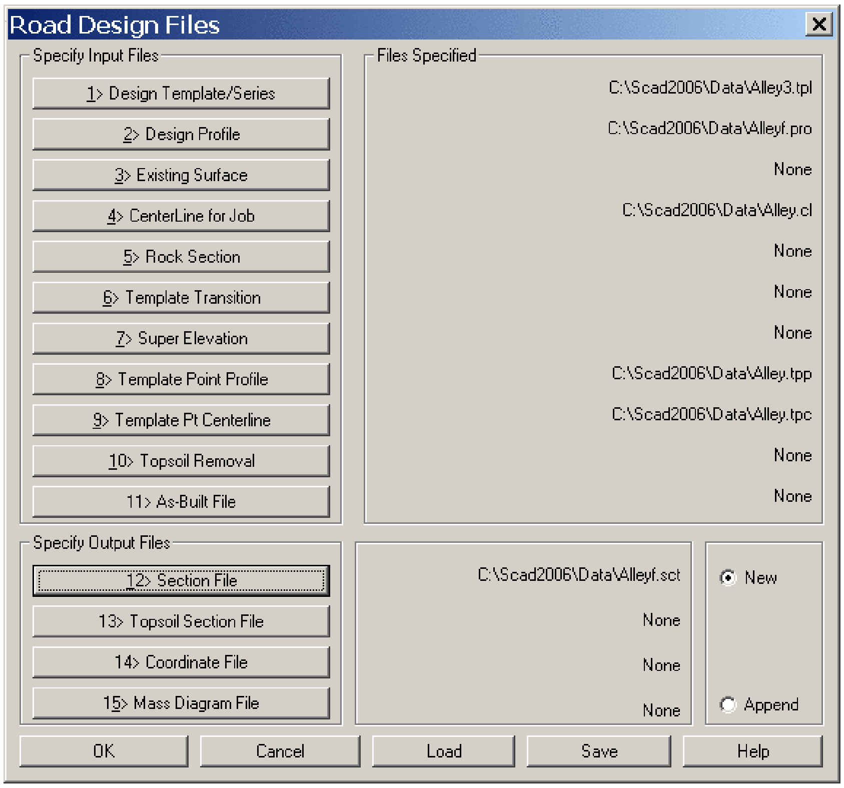
The next step is to set up the face of curb 3D polyline as a template point centerline and template point profile assigned to "EP". First you must do Polyline to Centerline File, pick the inner 3D polyline which is face of curb at proposed road level. Then you must do Profile from 3D Polyline and make a profile for the "EP". Then you assign this centerline and profile to the appropriate ID (EP) to force the curb to contact the correct curb position and elevation. The curb defined in the template matches the pattern of the in-place curb, so by setting EP to the correct template centerline and profile, the curb will "follow" at the correct position. The stationing used for the template point centerline is not critical to the calculation. However, the profile stationing much match and reference the centerline stationing. Therefore, when doing the command Profile from 3D Polyline, answer Yes to the question: "Station by another reference centerline [Yes/<No>]:". Making the Template Point Profile is always best accomplished by this method of Profile from 3D Polyline, referencing the design centerline. The Template Point Profile (and Template Point Centerline) would appear as shown here:



Define Template Alignments

Template ID	Side	File
EP	Right	c:\scad2006\DATA\EP.pro

The files in Process Road Design would be set up as follows:



Road Design Files

Specify Input Files

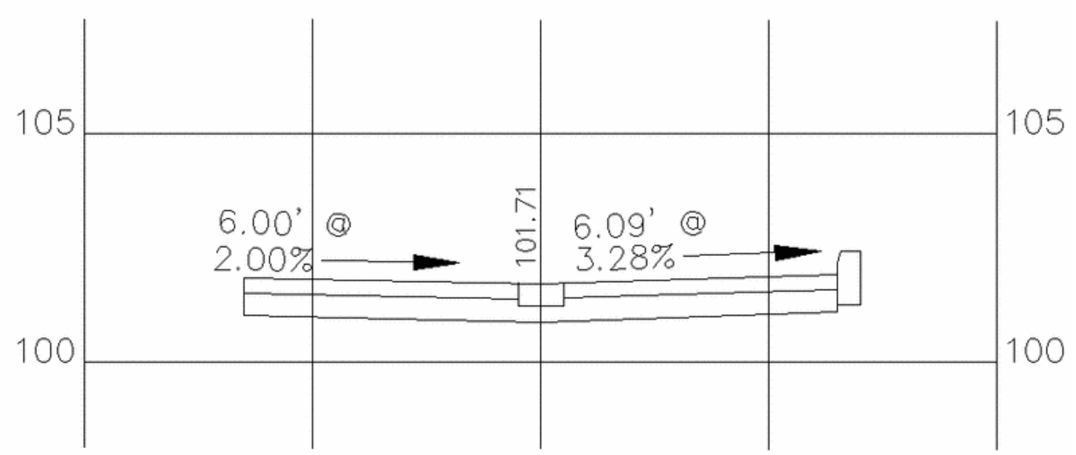
	Files Specified
1> Design Template/Series	C:\Scad2006\Data\Alley3.tpl
2> Design Profile	C:\Scad2006\Data\Alleyf.pro
3> Existing Surface	None
4> CenterLine for Job	C:\Scad2006\Data\Alley.cl
5> Rock Section	None
6> Template Transition	None
7> Super Elevation	None
8> Template Point Profile	C:\Scad2006\Data\Alley.tpp
9> Template Pt Centerline	C:\Scad2006\Data\Alley.tpc
10> Topsoil Removal	None
11> As-Built File	None

Specify Output Files

12> Section File	C:\Scad2006\Data\Alleyf.sct
13> Topsoil Section File	None
14> Coordinate File	None
15> Mass Diagram File	None

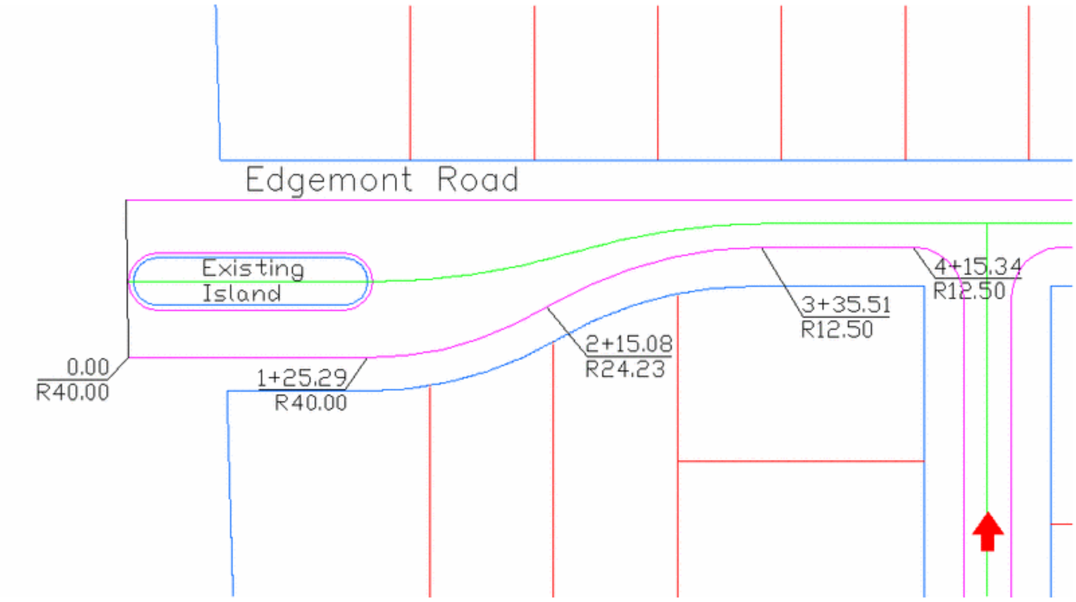
● New
○ Append

Note that no existing surface file is needed to compute final cross sections from as-built (straight wall on left of alley) to as-built (existing curb on right of alley). A final section is plotted below, showing the unique slope and lane distance determined by the as-built centerline and profile files that control the edge of pavement, and by extension, the curb, which continues with fixed dimensions from the edge of pavement.

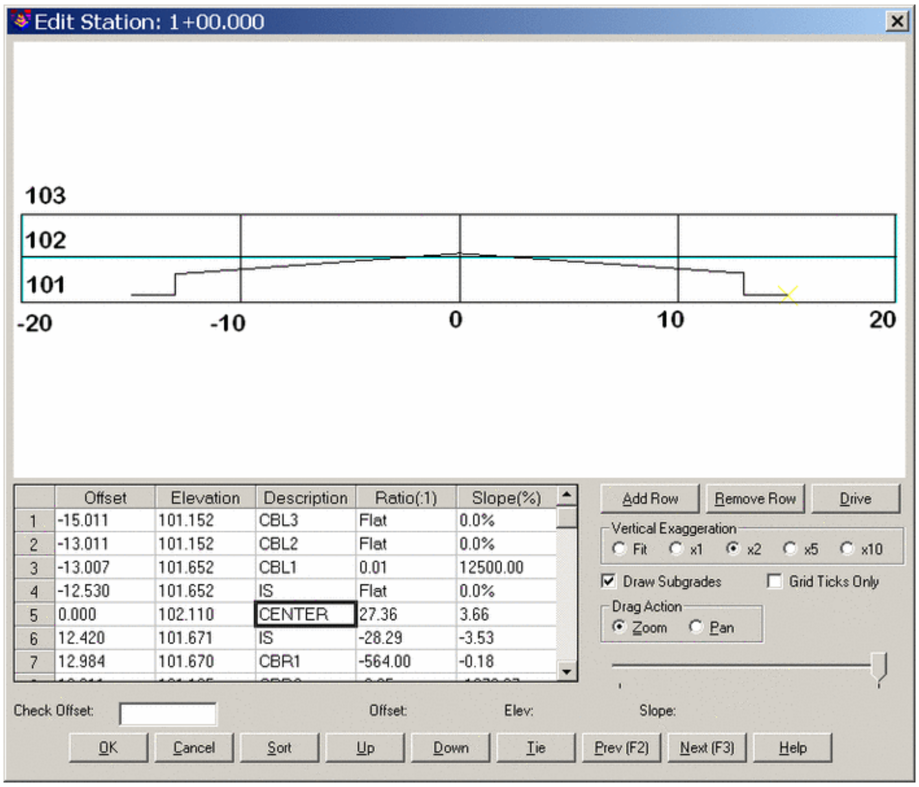


Station 0+50

A second method of doing as-built road design is to use the as-built cross section method. Whenever as-built cross sections are specified as part of the input files in Process Road Design, and then referenced for use on the Additional Road Design Parameters screen within Process Road, those offset IDs that are referenced will be held. Any matching IDs or new IDs found in the as-built cross sections will be substituted for the designed IDs within the final sections. In the example below, it might be proposed to redesign Edgemont Road from a roadside ditch road to one with a curb and gutter as well as sidewalks. However, the designer might want to keep the existing central median, already curb and gutter with plantings.


Edgemont Road
Existing Island
0.00
R40.00
1+25.29
R40.00
2+15.08
R24.23
3+35.51
R12.50
4+15.34
R12.50

This example raises the challenging issue of inserting special interior points with new IDs into a set of design cross sections, through a length of about 125 feet of road. If a cross section of the island is taken through station 1+00, it might have the following ID points:


Edit Station: 1+00.000
103
102
101
-20
-10
0
10
20
Add Row
Remove Row
Drive
Vertical Exaggeration
Fit
x1
x2
x5
x10
Grid Ticks Only
Drag Action
Pan
Check Offset:
Offset:
Elev:
Slope:
OK
Cancel
Sort
Up
Down
Tie
Prev (F2)
Next (F3)
Help

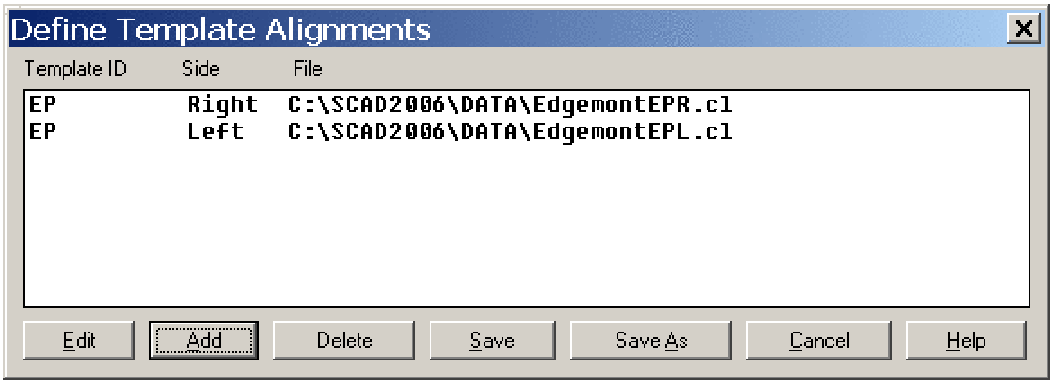
	Offset	Elevation	Description	Ratio(:1)	Slope(%)
1	-15.011	101.152	CBL3	Flat	0.0%
2	-13.011	101.152	CBL2	Flat	0.0%
3	-13.007	101.652	CBL1	0.01	12500.00
4	-12.530	101.652	IS	Flat	0.0%
5	0.000	102.110	CENTER	27.36	3.66
6	12.420	101.671	IS	-28.29	-3.53
7	12.984	101.670	CBR1	-564.00	-0.18

Vertical Exaggeration: ● x2

☑ Draw Subgrades

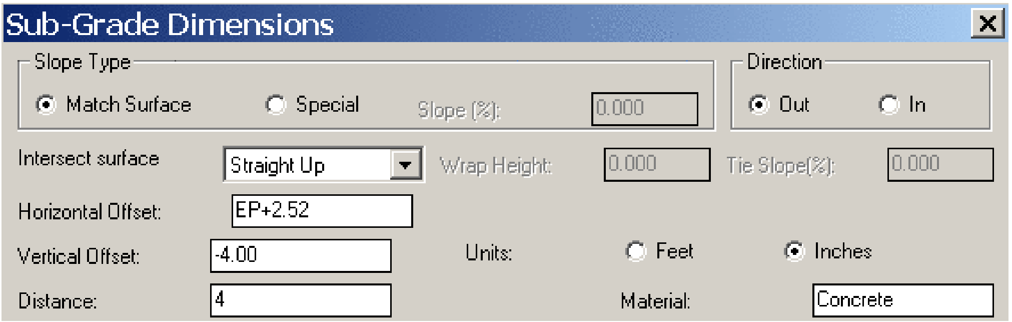
Drag Action: ● Zoom

This cross section could then be part of an as-built cross section file (.SCT) which can be recorded at any desired station interval, the smaller the interval, the greater the accuracy. Now if the actual road template is defined as EP for edge of pavement and standard CB for curb, with CENTER for the centerline position, Process Road Design will substitute the As-Built File CENTER ID for the one calculated by the program, and will add in all the unique IDs from the cross section file, from -15.011 left to 15 right. Interestingly enough, this Edgemont Road example would also require a Template Point Centerline for the left and right edge of pavement, to pull the paving edge out to the expanded road dimension, which doesn't taper to normal until station 3+35.51. It would not require a Template Point Profile, so long as the road maintained a consistent design slope from centerline. When using Template Point Centerline, you need to turn the edge of pavement polylines into centerline files. Before doing so, test each polyline with the command Reverse Polyline (within Polyline Utilities under Edit) to verify that the polyline is drawn in the correct direction, as shown by the phantom arrows. The file Template Point Centerline elements might appear as shown:



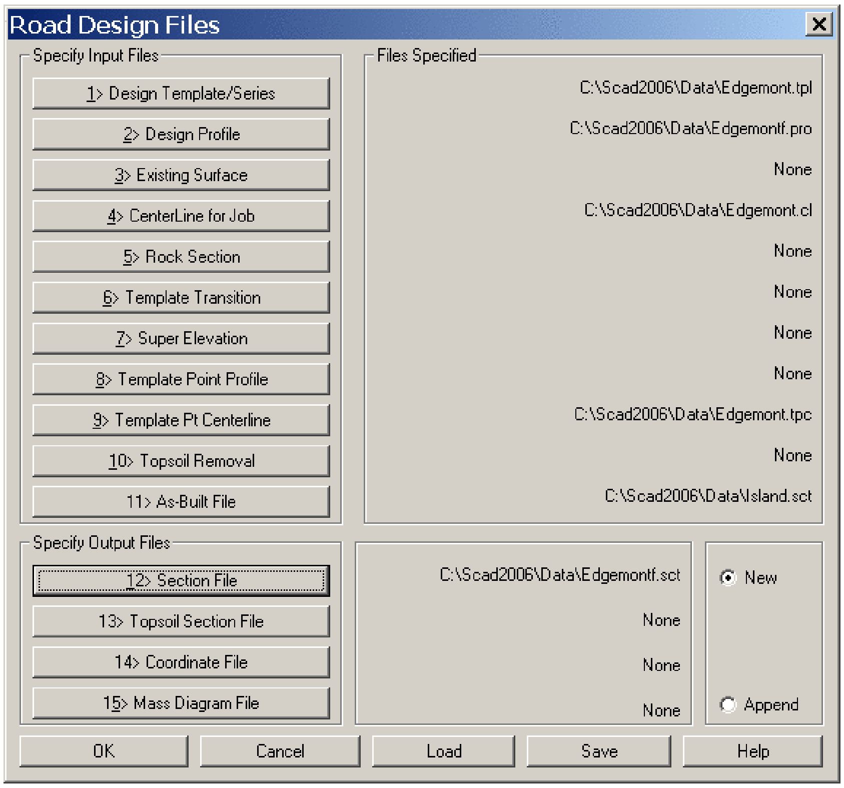
Template ID	Side	File
EP	Right	C:\SCAD2006\DATA\EdgemontEPR.cl
EP	Left	C:\SCAD2006\DATA\EdgemontEPL.cl

Be aware that a subgrade such as a concrete sidewalk, if it is to be placed behind the curb, must reference the curb or the edge of pavement ID for positioning, whenever the edge of pavement offset is changing based on use of a Template Point Centerline or As-Built cross section file containing duplicated IDs for edge of pavement. You can specify an offset for the sidewalk in the Subgrade option within Design Template, as shown below. The "2.52" offset was used to move past the tilting edge of the back-of-curb, which slightly exceeds 2.50.



Slope Type: ● Match Surface ○ Special Slope (%): 0.000
Direction: ● Out ○ In
Intersect surface: Straight Up
Wrap Height: 0.000
Tie Slope(%): 0.000
Horizontal Offset: EP+2.52
Vertical Offset: -4.00
Units: ○ Feet ● Inches
Distance: 4
Material: Concrete

If the Island.sct file is the as-built cross sections, the entire input screen for the Edgemont Road project might appear as follows:



Road Design Files

Specify Input Files

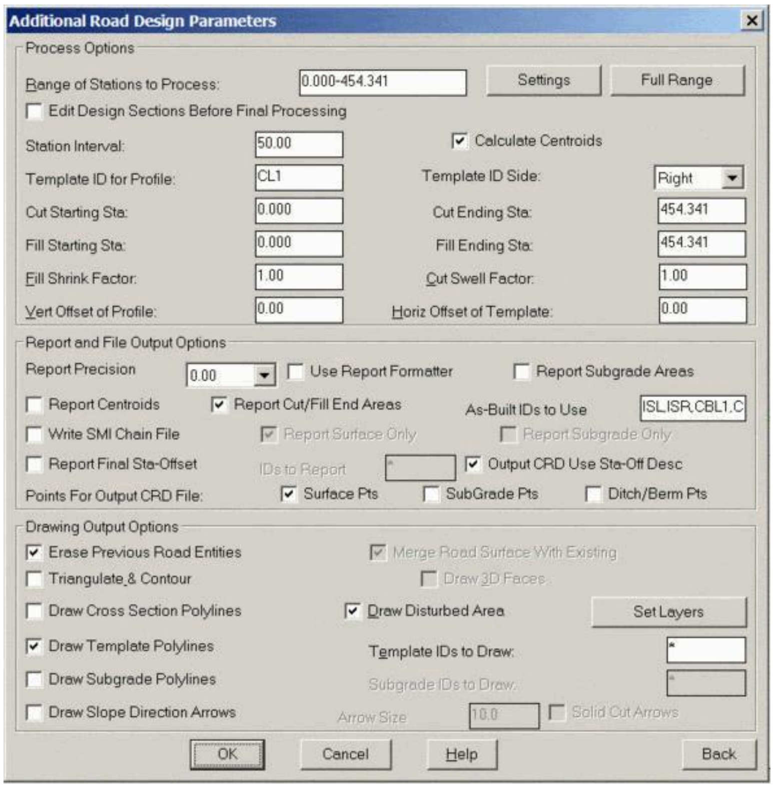
Input file	Files Specified
1> Design Template/Series	C:\Scad2006\Data\Edgemont.tpl
2> Design Profile	C:\Scad2006\Data\Edgemontf.pro
3> Existing Surface	None
4> CenterLine for Job	C:\Scad2006\Data\Edgemont.cl
5> Rock Section	None
6> Template Transition	None
7> Super Elevation	None
8> Template Point Profile	None
9> Template Pt Centerline	C:\Scad2006\Data\Edgemont.tpc
10> Topsoil Removal	None
11> As-Built File	C:\Scad2006\Data\Island.sct

Specify Output Files

Output file	File
12> Section File	C:\Scad2006\Data\Edgemontf.sct
13> Topsoil Section File	None
14> Coordinate File	None
15> Mass Diagram File	None

● New ○ Append

In the next dialog, fill in the descriptions for the section points in the As-Built IDs To Use field.



Additional Road Design Parameters

Process Options

Range of Stations to Process: 0.000-454.341

☐ Edit Design Sections Before Final Processing

Station Interval: 50.00

☑ Calculate Centroids

Template ID for Profile: CL1

Template ID Side: Right

Cut Starting Sta: 0.000

Cut Ending Sta: 454.341

Fill Starting Sta: 0.000

Fill Ending Sta: 454.341

Fill Shrink Factor: 1.00

Cut Swell Factor: 1.00

Vert Offset of Profile: 0.00

Horiz Offset of Template: 0.00

Report and File Output Options

Report Precision: 0.00

☐ Use Report Formatter

☐ Report Subgrade Areas

☐ Report Centroids

☑ Report Cut/Fill End Areas

As-Built IDs to Use: ISL,ISR,CBL1,C

☐ Write SMI Chain File

☑ Report Surface Only

☐ Report Subgrade Only

☐ Report Final Sta-Offset

IDs to Report: *

☑ Output CRD Use Sta-Off Desc

Points For Output CRD File: ☑ Surface Pts ☐ SubGrade Pts ☐ Ditch/Berm Pts

Drawing Output Options

☑ Erase Previous Road Entities

☑ Merge Road Surface With Existing

☐ Triangulate & Contour

☐ Draw 3D Faces

☐ Draw Cross Section Polylines

☑ Draw Disturbed Area

☑ Draw Template Polylines

Template IDs to Draw: *

☐ Draw Subgrade Polylines

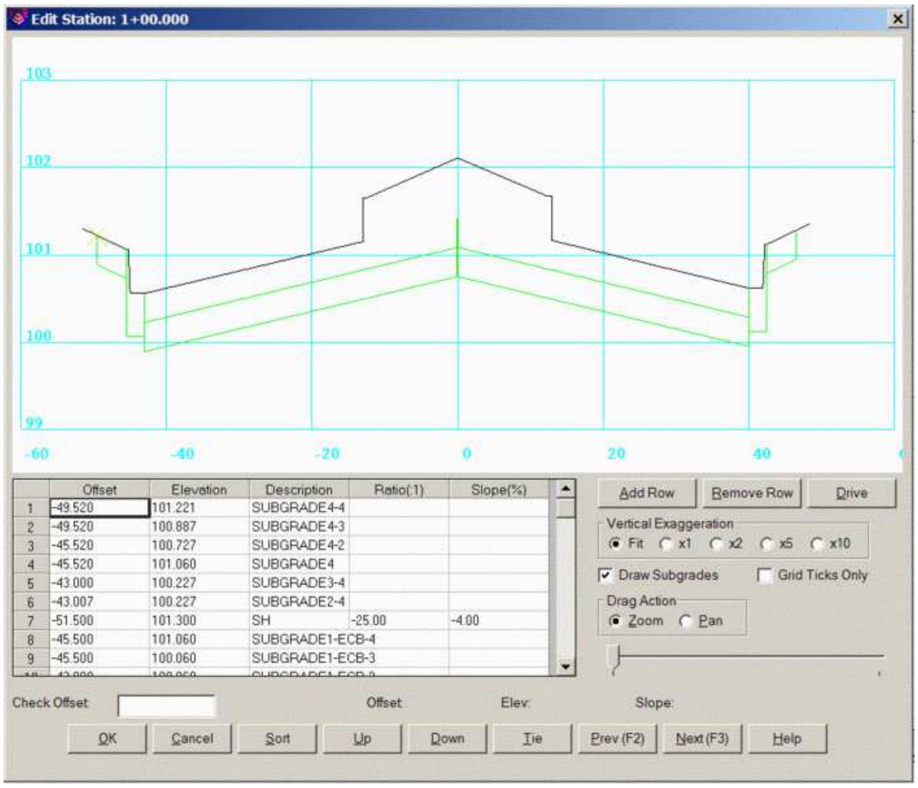
Subgrade IDs to Draw: *

☐ Draw Slope Direction Arrows

Arrow Size: 10.0

☐ Solid Cut Arrows

Here is the resulting output section file showing the combination of the design template with the as-built section points.


Edit Station: 1+00.000
103
102
101
100
99
-60
-40
-20
0
20
40
Add Row
Remove Row
Drive
Vertical Exaggeration
● Fit ○ x1 ○ x2 ○ x5 ○ x10
☑ Draw Subgrades
☐ Grid Ticks Only
Drag Action
● Zoom ○ Pan
OK
Cancel
Sort
Up
Down
Tie
Prev (F2)
Next (F3)
Help

	Offset	Elevation	Description	Ratio(:1)	Slope(%)
1	-49.520	101.221	SUBGRADE4-4		
2	-49.520	100.887	SUBGRADE4-3		
3	-45.520	100.727	SUBGRADE4-2		
4	-45.520	101.060	SUBGRADE4		
5	-43.000	100.227	SUBGRADE3-4		
6	-43.007	100.227	SUBGRADE2-4		
7	-51.500	101.300	SH	-25.00	-4.00
8	-45.500	101.060	SUBGRADE1-ECB-4		
9	-45.500	100.060	SUBGRADE1-ECB-3		

Check Offset

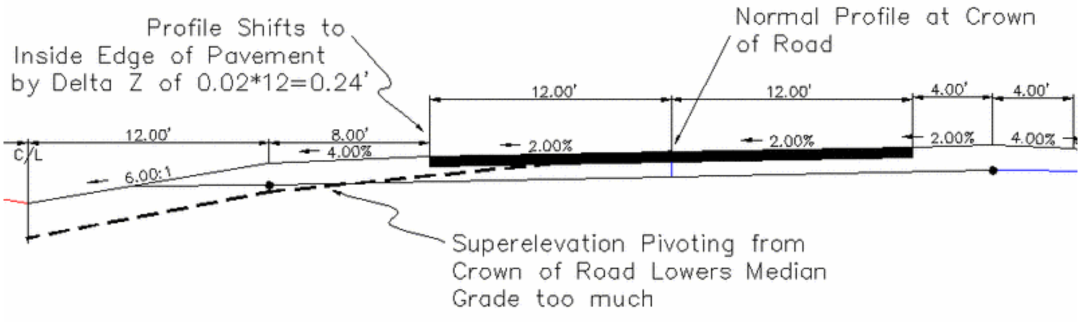
Offset:

Elev:

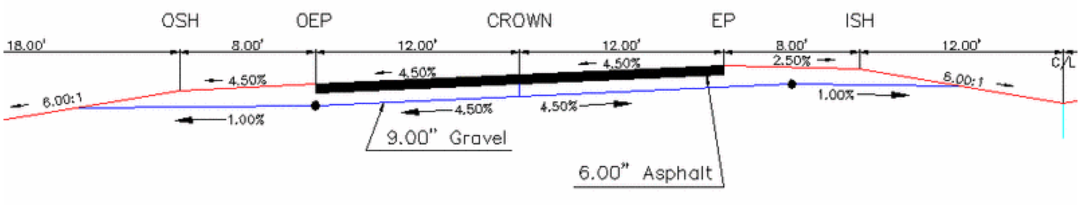
Slope:

Example Divided Highway with Special Super Elevation Treatment

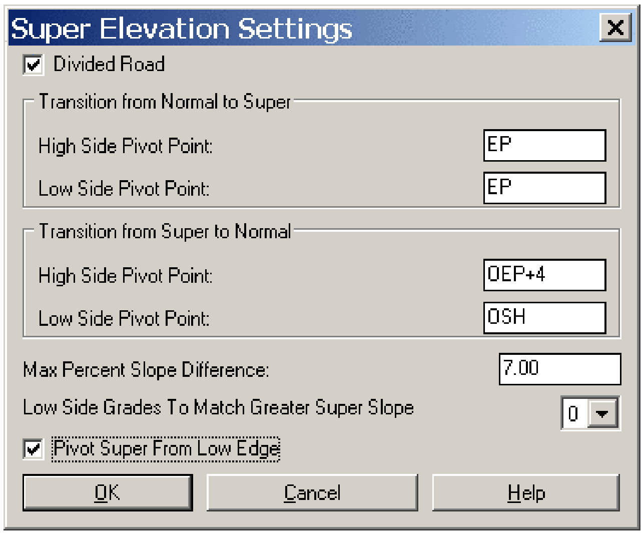
Divided highways such as 4-lane highways with a central depressed, grassy median are among the most challenging roads to define as templates, especially when accurate subgrade elevations and quantities are involved. Rules for superelevation and subgrade pivot points must be applied. And most divided highways do not use the centerline as the profile and require shifting the profile elevation to a specific template ID, like the inside edge of pavement or crown point for each side of the highway. This shifting occurs within Process Road Design. Furthermore, many highway departments have complicated rules for the profile grade. One such rule is that in superelevation, when the pivot lane reaches reverse crown, the profile moves from the crown of the road to the inside edge of pavement. Whatever the delta Z between the crown profile grade and inside edge of pavement profile grade is at reverse crown, this delta Z is subtracted from the profile grade and determines the profile of the inside edge of pavement from reverse crown through full super and back to reverse crown again. This typically improves drainage within the median portion, since a steep superelevation pivoting from the crown of the road can either reduce the median depth, or force the median too low. This is illustrated in the graphic below. Such challenging highways can be designed using special features within Design Template and Process Road Design.


Profile Shifts to
Inside Edge of Pavement
by Delta Z of 0.02*12=0.24'
Normal Profile at Crown
of Road
12.00'
12.00'
4.00'
4.00'
12.00'
8.00'
4.00%
2.00%
2.00%
2.00%
4.00%
C/L
6.00:1
Superelevation Pivoting from
Crown of Road Lowers Median
Grade too much

The divided highway template itself can be quite complex. Let's review the requirements of our template below, first left side, then right side, in superelevation of 4.5%.



The main criteria for the design is that the pavement lanes are 12' wide, with 2% slope from the crown point in the middle (except in superelevation). On the interior high side of superelevation shown above, the grade breaks off at the EP or inside edge of pavement, and the maximum algebraic difference is 7%. So at 4.5% superelevation, the normal 4% downhill shoulder slopes instead at 7%-4.5%=2.5%, as shown. This part of the template behavior is controlled by the Superelevation Shoulder button within Design Template, with entries as shown here:



Super Elevation Settings

☑ Divided Road

Transition from Normal to Super

High Side Pivot Point: EP

Low Side Pivot Point: EP

Transition from Super to Normal

High Side Pivot Point: OEP+4

Low Side Pivot Point: OSH

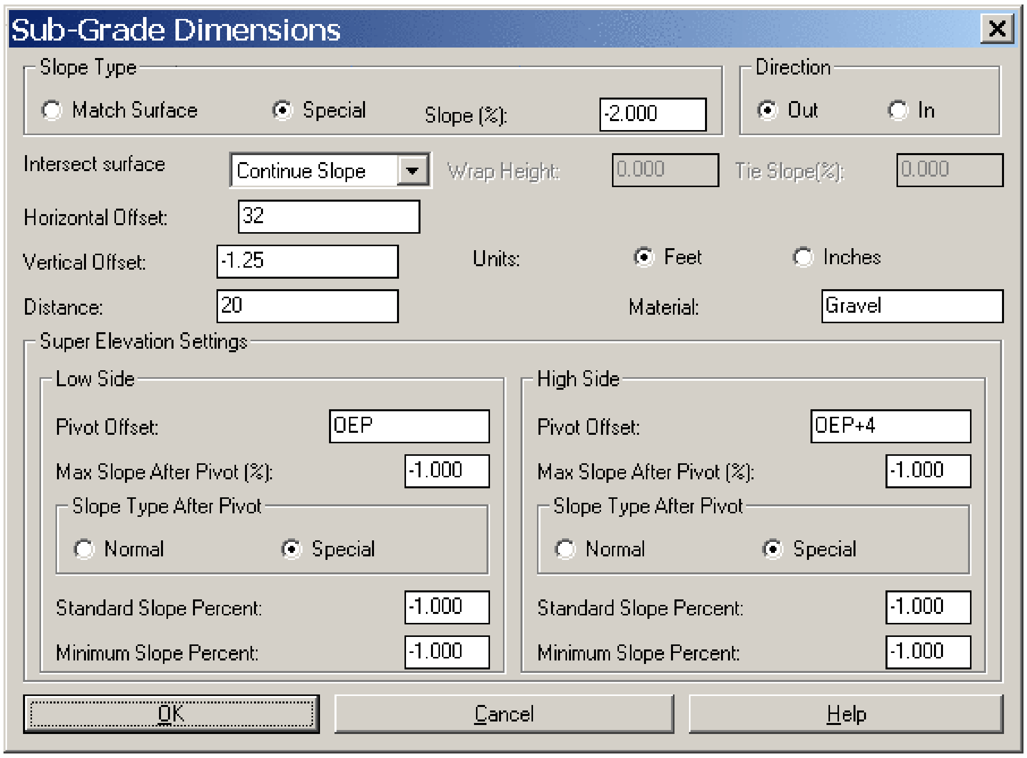
Max Percent Slope Difference: 7.00

Low Side Grades To Match Greater Super Slope: 0

☑ Pivot Super From Low Edge

Note that the Super Elevation Settings dialog treats the "interior" of the road in the upper part, and the exterior of the entire road (like a 2-lane road) in the lower part. So the "Low Side Pivot Point" under the lower "Transition from Super to Normal" is where, walking from the middle of the road towards the left, super ends and normal slopes resume. That is set to OSH, or the outside shoulder position, the goal being to slope the full shoulder with the superelevation on the lower outside shoulder lane, then resume normal (non-super) slope at the 6:1 "recovery zone" slope. The entry of OSH as Low Side Pivot Point for Super to Normal controls that. In the upper part of the dialog, the inside "Transition from Normal to Super" sets the Low Side Pivot Point at EP. So at EP, walking from the template center left towards the left side of the road, normal ends at EP and superelevation begins. So the median upslope of 6:1 is normal, as is the shoulder, the super starts at EP. But because the 7% maximum percent slope difference is active, the shoulder can't remain at 4% but goes to 2.5% leading to the 4.5% superelevation. When super subsides to 3% or less, the shoulder would be normal at 4% as specified in the template design in this case.

Referring to the graphic above showing the left side of the divided highway, the gravel for the shoulder is shown running out to "daylight" on the outside recovery zone and on the inside median slope. However, to reduce quantities of stone, the stone runs at a uniform slope of -2% in normal crown, or matches superelevation, but pivots to 1% downhill at the outside OEP and 4' past the inside EP. This is accomplished through the subgrade entry dialog. First, the outside subgrade:



Slope Type: ○ Match Surface ● Special Slope (%): -2.000

Direction: ● Out ○ In

Intersect surface: Continue Slope Wrap Height: 0.000 Tie Slope(%): 0.000

Horizontal Offset: 32

Vertical Offset: -1.25 Units: ● Feet ○ Inches

Distance: 20 Material: Gravel

Super Elevation Settings

Low Side

Pivot Offset: OEP

Max Slope After Pivot (%): -1.000

Slope Type After Pivot: ○ Normal ● Special

Standard Slope Percent: -1.000

Minimum Slope Percent: -1.000

High Side

Pivot Offset: OEP+4

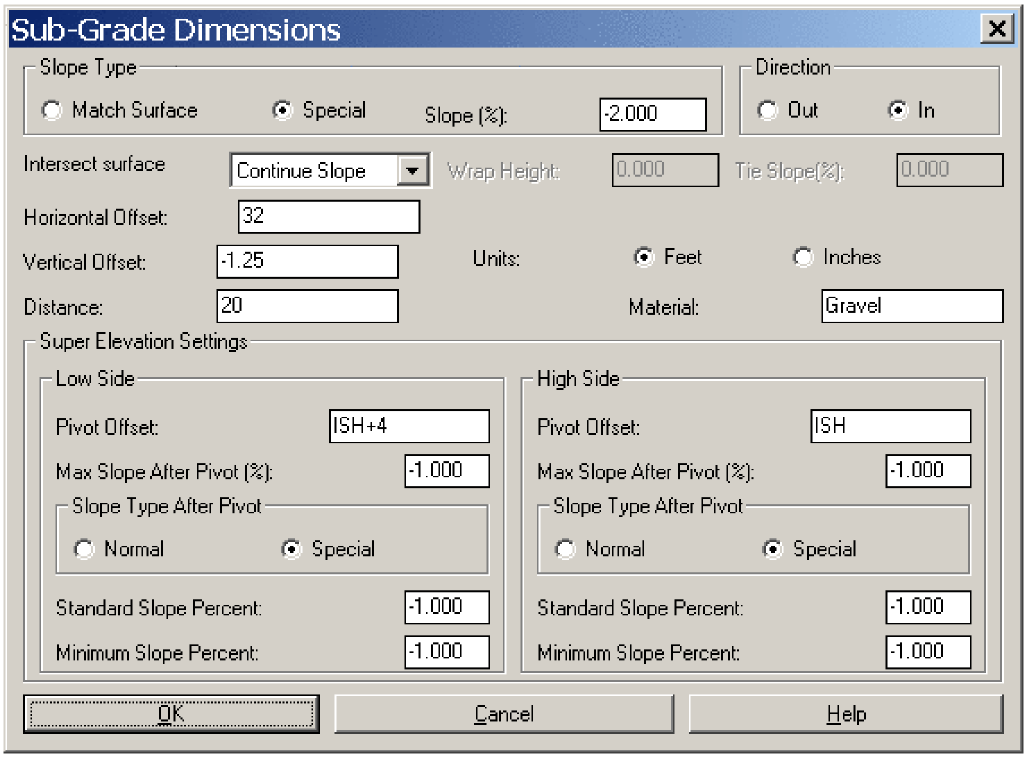
Max Slope After Pivot (%): -1.000

Slope Type After Pivot: ○ Normal ● Special

Standard Slope Percent: -1.000

Minimum Slope Percent: -1.000

Note that the normal slope of the stone subgrade does not follow the surface but stays at the "special" slope of -2%, matching the surface always only beneath the asphalt portion within the pavement zone. For divided highways, it is always necessary to do at least 2 subgrades for each material: one from the crown or middle of the road "out" to the outslope (as above), and one from the crown or middle of the paved portion in to the interior. Since the crown of the road on each side of the highway is 32 feet left of the center depressed median position, the horizontal offset for the "out" position is 32. Enter the vertical offset as the entire distance from the horizontal offset down to subgrade bottom. In this way, any other thinner subgrades above are deducted from total subgrade quantities of the grade under consideration. If the goal is to "force" a -1% slope in both normal crown and superelevation, then set the Max Slope After Pivot(%) to -1%, and click "Special". Then set both Standard Slope and Minimum Slope Percent to -1%. This ensure that -1% will be used at the pivot offset of OEP, or as specified. Apply this to both subgrades ("in" and "out" from horizontal offset 32). If you simply entered -1% for the Max Slope After Pivot(%) and clicked Normal, slopes on the low side would break over to -1% but slopes on the higher side of each superelevation lane (beneath inside shoulder on the left, outside shoulder on the right) would continue on at the super slope and not break off. You must use the "Special" setting. The low side shoulder for the inside portion of the left side of the road is specified by the "In" subgrade, in this dialog:



Sub-Grade Dimensions

Slope Type: ○ Match Surface ● Special Slope (%): -2.000

Direction: ○ Out ● In

Intersect surface: Continue Slope Wrap Height: 0.000 Tie Slope(%): 0.000

Horizontal Offset: 32

Vertical Offset: -1.25 Units: ● Feet ○ Inches

Distance: 20 Material: Gravel

Super Elevation Settings

Low Side

Pivot Offset: ISH+4

Max Slope After Pivot (%): -1.000

Slope Type After Pivot: ○ Normal ● Special

Standard Slope Percent: -1.000

Minimum Slope Percent: -1.000

High Side

Pivot Offset: ISH

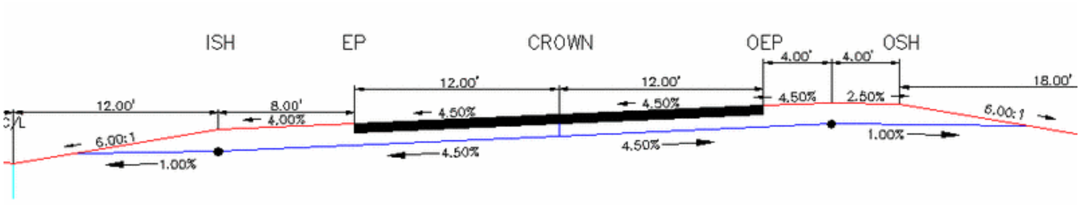
Max Slope After Pivot (%): -1.000

Slope Type After Pivot: ○ Normal ● Special

Standard Slope Percent: -1.000

Minimum Slope Percent: -1.000

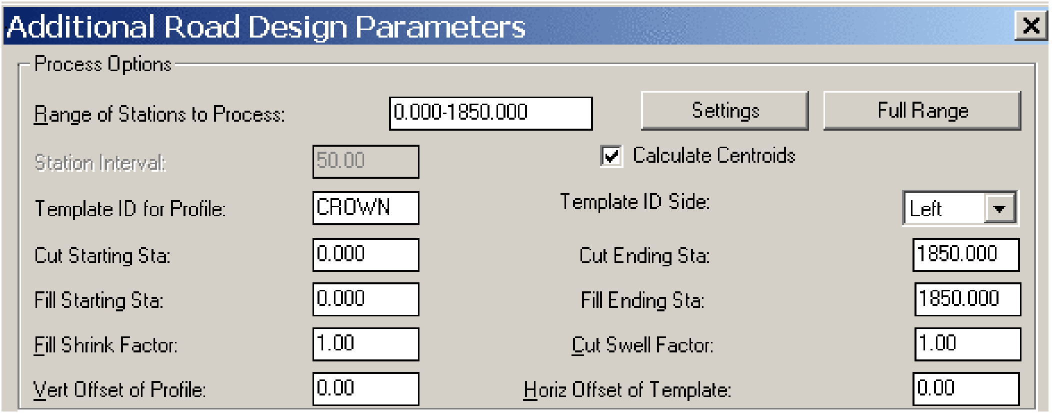
The pivot point for the subgrade on the inside left of the template is ISH+4, or 4 feet from inside shoulder to inside edge of pavement, the +4 being the direction walking out from the middle of the template in all cases. The right side of the template is shown next:



On the right side, the high-side subgrade pivot in the "out" direction, walking from the middle of the road outward, is OEP+4. On the right side, the high-side subgrade pivot in the "in" direction is simply ISH, as shown. So the controls exist to specify critical break points on subgrade and surface grades using Design Template. Whether this is the best design can be debated, but the controls are there to create surface and subgrade slope breaks and grade changes.

Referring to the Super Elevation Settings dialog above, the key to setting the superelevation of the divided highway to the inside edge of pavement at reverse crown (minus the 0.24 delta Z from profile grade to inside edge of pavement grade) is to click on the option, "Pivot Super From Low Edge".

Now you must run Process Road Design, using this template, to produce verifiable final cross sections. Set the Process Road "Additional Parameters" dialog such that "Crown" (or whatever ID is used for the center crown point on each side of the road) controls the profile grade.


Additional Road Design Parameters

Process Options

Range of Stations to Process: 0.000-1850.000

Station Interval: 50.00

☑ Calculate Centroids

Template ID for Profile: CROWN

Template ID Side: Left

Cut Starting Sta: 0.000

Cut Ending Sta: 1850.000

Fill Starting Sta: 0.000

Fill Ending Sta: 1850.000

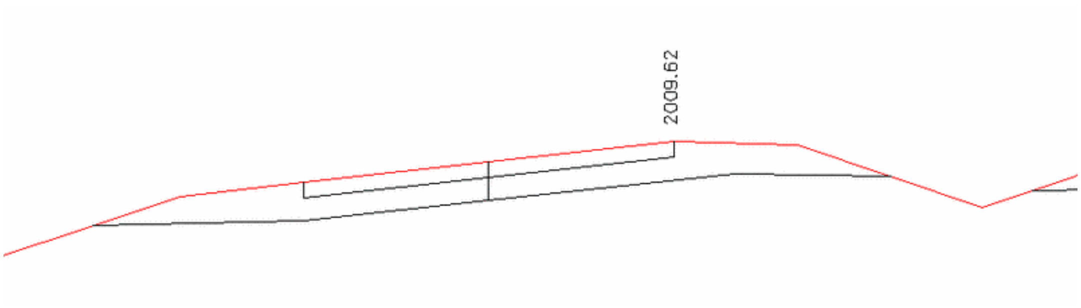
Fill Shrink Factor: 1.00

Cut Swell Factor: 1.00

Vert Offset of Profile: 0.00

Horiz Offset of Template: 0.00

The final sections that are produced will shift the profile grade to the inside edge of pavement from reverse crown to reverse crown through superelevation, adjusted -0.24'. A final section is shown plotted below as drawn using Draw Section File:



Pulldown Menu Location: Roads
Keyboard Command: eworks
Prerequisite: Profile file and template file

Road Network

This command synthesizes road network design for subdivisions and commercial and industrial sites by enabling interactive 3D design of all road centerlines, profiles and templates, including cul-de-sacs. A docked dialog on the left of the screen identifying the existing DTM surface and all road files combines with an active CAD screen and command line. You can save drawings and run virtually any standard Autocad command while within the docked dialog. Once the user identifies all centerlines involved, the program detects intersections and end segments suitable for cul-de-sacs, and through user input of design parameters for cul-de-sac dimensions and intersection transitions, the program will process the complete 3D design, with output options including cross sections, 3D faces, TIN files and contours. The many roading files involved in a road network design are all saved to an "RDN" file that can be recalled, modified and re-processed.

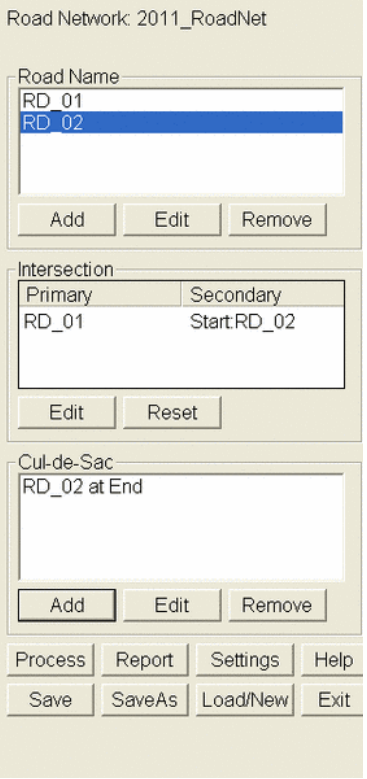
This **Road Network Help** document is divided into 7 parts: ***Road Network Task Pane***, ***Road Network Settings***, ***Adding and Editing Roads***, ***Road Network Road Profile Editor***, ***Adding and Editing Intersections***, ***Adding and Editing Cul de Sacs***, ***Road Network Workflow Example #1*** and ***Road network Workflow Example #2***

When designing roads using Carlson's **Road Network** feature, all work is done through a **Task Pane** that docks along the left side of the drawing screen. Having the **Task Pane** open and active does not prohibit or interfere with normal Command: line or other CAD functionality.

All settings and files associated with a roadway design project are saved in the Road Network (.RDN) file. Upon starting the **Road Network** command, the user is prompted to open an existing or create a new Road Network

(.RDN) file in which to save the project data. Once loaded, the active Road Network filename is displayed at the top of the **Task Pane**.

Once Roads, Intersections and Cul-de-Sacs have been added to the Road Network, selecting any one of them in the **Task Pane** highlights the feature and centers it in the drawing screen. Highlighting and centering options may be changed in the **Display Options** tab of the **Road Network Settings** dialog box.



Road Network: 2011_RoadNet

Road Name

RD_01
RD_02

Intersection

Primary	Secondary
RD_01	Start:RD_02

Cul-de-Sac

RD_02 at End

Road Network Task Pane

This area of the **Task Pane** lists the Roads defined as part of the Road Network. See **Road Network: Adding and Editing Roads** for additional assistance.

Add: Pick this button to **Add** a Road to the Network. After adding the Road, the **Edit Road** dialog box is displayed allowing the user to manage and make changes to the **Input Files** and **Output Files** for the selected Road.
Edit: Pick this button to display the **Edit Road** dialog box to manage and make changes to the **Input Files** and **Output Files** for the selected Road.
Remove: Pick this button to delete the selected Road from the Road Network. After Removing the Road from the Network the design files associated with that Road will remain in the project folder.

This area of the **Task Pane** lists the Intersections within the Road Network. Intersections are created automatically as intersecting Roads are added to the Network. See **Road Network: Adding and Editing Intersections** for additional assistance.

Edit: Use this button to display the **Edit Intersection** dialog box and make changes to the **Input Data** and **Output Files** for the selected Intersection. Other changes that can be made to the Intersection design are:

1) Changing the Primary/Secondary status of the Roads creating the Intersection,
2) Making design changes that apply to the entire Intersection,
3) Making design changes that apply to one or more Corners of the Intersection.

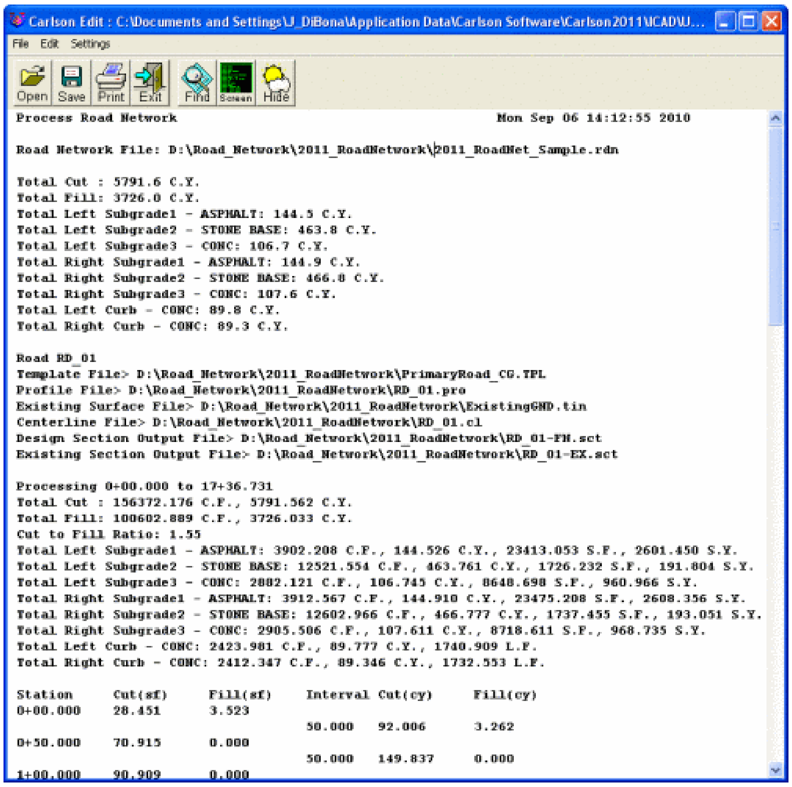
Reset: Use this button to overwrite all design changes made to the selected Intersection and reset to the original Intersection design.

This area of the **Task Pane** lists the Cul-de-Sacs defined as part of the Road Network. See **Road Network: Adding and Editing Cul-de-Sacs** for additional assistance.

Add: Picking this button will display a list of Roads in the Network and prompt the user to **"Select Road for Cul-de-Sac"....** After selecting the Road, the **Edit Cul-de-Sac** dialog box is displayed allowing the user to specify the **Input Data** and **Output Files** for the Cul-de-Sac.
Edit: Use this button to display the **Edit Cul-de-Sac** dialog box and make changes to the **input data** and **output files** for the selected Cul-de-Sac.
Remove: Use this button to **Remove** the selected Cul-de-Sac from the Road.

Process: Use this button to manually trigger the computation process for the Road Network and perform the tasks configured in the **Output Options** tab of the **Road Network Settings** dialog box.
Report: Use this button to Save or Print one of two Reports provided by the **Road Network** feature which are: the ***Output Processing*** report and the ***Input Data File***s report. Default Report settings can be changed in the **Report Options** tab of the **Road Network Settings** dialog box.

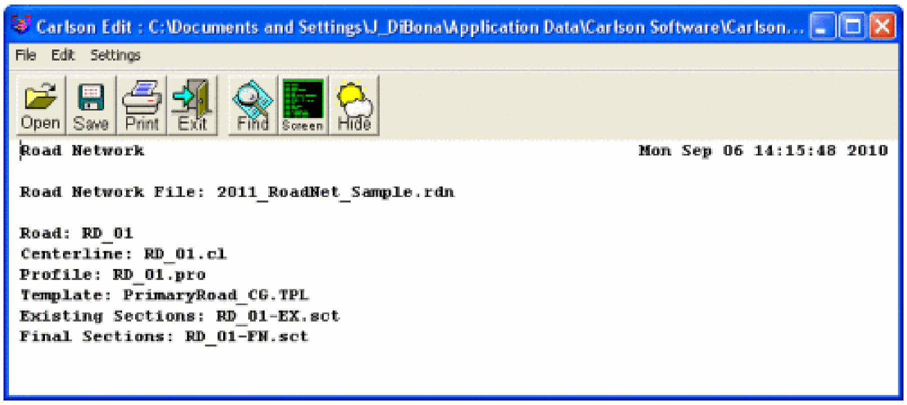
The ***Output Processing*** Report displays the cut/fill and material quantities for each Road, Intersection and Cul-de-Sac of the Road Network.


Carlson Edit : C:\Documents and Settings\J_DiBona\Application Data\Carlson Software\Carlson2011\ICAD\U...
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Process Road Network                                        Mon Sep 06 14:12:55 2010

Road Network File: D:\Road_Network\2011_RoadNetwork\2011_RoadNet_Sample.rdn

Total Cut : 5791.6 C.Y.
Total Fill: 3726.0 C.Y.
Total Left Subgrade1 - ASPHALT: 144.5 C.Y.
Total Left Subgrade2 - STONE BASE: 463.8 C.Y.
Total Left Subgrade3 - CONC: 106.7 C.Y.
Total Right Subgrade1 - ASPHALT: 144.9 C.Y.
Total Right Subgrade2 - STONE BASE: 466.8 C.Y.
Total Right Subgrade3 - CONC: 107.6 C.Y.
Total Left Curb - CONC: 89.8 C.Y.
Total Right Curb - CONC: 89.3 C.Y.

Road RD_01
Template File> D:\Road_Network\2011_RoadNetwork\PrimaryRoad_CG.TPL
Profile File> D:\Road_Network\2011_RoadNetwork\RD_01.pro
Existing Surface File> D:\Road_Network\2011_RoadNetwork\ExistingGND.tin
Centerline File> D:\Road_Network\2011_RoadNetwork\RD_01.cl
Design Section Output File> D:\Road_Network\2011_RoadNetwork\RD_01-FN.sct
Existing Section Output File> D:\Road_Network\2011_RoadNetwork\RD_01-EX.sct

Processing 0+00.000 to 17+36.731
Total Cut : 156372.176 C.F., 5791.562 C.Y.
Total Fill: 100602.889 C.F., 3726.033 C.Y.
Cut to Fill Ratio: 1.55
Total Left Subgrade1 - ASPHALT: 3902.208 C.F., 144.526 C.Y., 23413.053 S.F., 2601.450 S.Y.
Total Left Subgrade2 - STONE BASE: 12521.554 C.F., 463.761 C.Y., 1726.232 S.F., 191.804 S.Y.
Total Left Subgrade3 - CONC: 2882.121 C.F., 106.745 C.Y., 8648.698 S.F., 960.966 S.Y.
Total Right Subgrade1 - ASPHALT: 3912.567 C.F., 144.910 C.Y., 23475.208 S.F., 2608.356 S.Y.
Total Right Subgrade2 - STONE BASE: 12602.966 C.F., 466.777 C.Y., 1737.455 S.F., 193.051 S.Y.
Total Right Subgrade3 - CONC: 2905.506 C.F., 107.611 C.Y., 8718.611 S.F., 968.735 S.Y.
Total Left Curb - CONC: 2423.981 C.F., 89.777 C.Y., 1740.909 L.F.
Total Right Curb - CONC: 2412.347 C.F., 89.346 C.Y., 1732.553 L.F.

Station     Cut(sf)     Fill(sf)     Interval Cut(cy)     Fill(cy)
0+00.000    28.451      3.523
                                     50.000   92.006      3.262
0+50.000    70.915      0.000
                                     50.000   149.837     0.000
1+00.000    90.909      0.000
```

Road Network *Output Processing* Report

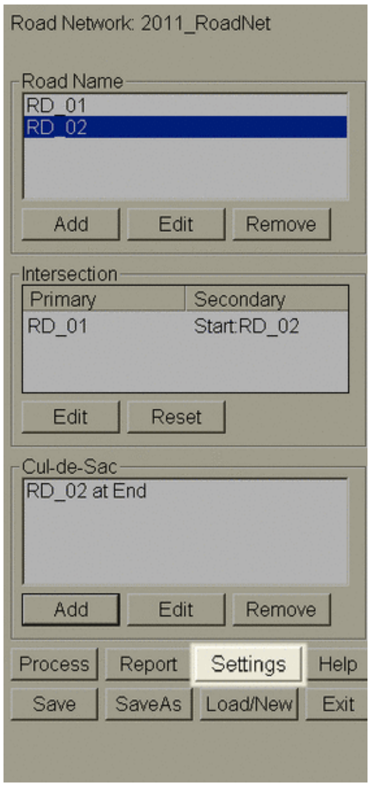
The ***Input Data Files*** Report displays all of the user-specified design files associated with the Road Network. The user has the option of reporting only the filename or both the path and filename.


Carlson Edit : C:\Documents and Settings\J_DiBona\Application Data\Carlson Software\Carlson...
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Road Network                                                    Mon Sep 06 14:15:48 2010

Road Network File: 2011_RoadNet_Sample.rdn

Road: RD_01
Centerline: RD_01.cl
Profile: RD_01.pro
Template: PrimaryRoad_CG.TPL
Existing Sections: RD_01-EX.sct
Final Sections: RD_01-FN.sct
```

Road Network *Input Data Files* Report

Settings: This button displays the **Road Network Settings** dialog box which is the starting place for all projects designed using the **Road Network** feature. There are 5 tabs in the dialog box: ***Process Options***, ***Output Options***, ***Report Options***, ***Display Options*** and ***Transition Defaults***.
Save: Pick this button to **Save** the Road Network (.RDN) file.
SaveAs: Pick this button to Save the current Road Network (.RDN) file and give it a new path and/or filename.
Load/New: Pick this button to **Load** an existing or start a **New** Road Network (.RDN) file.
Exit: Pick this button to **Exit** the Road Network command and close the **Task Pane**.
The **Road Network Settings** dialog box is accessible from the **Settings** button on the **Road Network: Task Pane**.


Road Network: 2011_RoadNet
Road Name
Add
Edit
Remove
Intersection
Edit
Reset
Cul-de-Sac
Add
Edit
Remove
Process
Report
Settings
Help
Save
SaveAs
Load/New
Exit

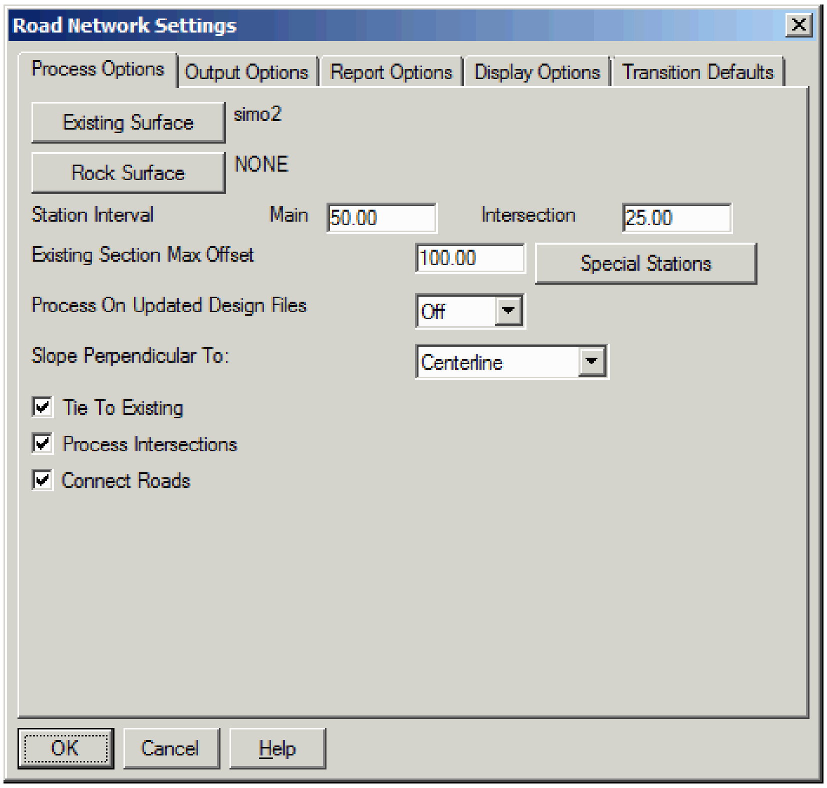
Road Name: RD_01, RD_02

Primary	Secondary
RD_01	Start:RD_02

Cul-de-Sac: RD_02 at End

Settings Button of the Road Network Task Pane

The **Road Network Settings** dialog box is the starting place for all projects designed using the **Road Network** feature. There are 5 tabs in the dialog box: ***Process Options***, ***Output Options***, ***Report Options***, ***Display Options*** and ***Transition Defaults***.


Road Network Settings
Process Options
Output Options
Report Options
Display Options
Transition Defaults
Existing Surface
Rock Surface
Special Stations
OK
Cancel
Help

Existing Surface simo2

Rock Surface NONE

Station Interval Main 50.00 Intersection 25.00

Existing Section Max Offset 100.00

Process On Updated Design Files Off

Slope Perpendicular To: Centerline

☑ Tie To Existing

☑ Process Intersections

☑ Connect Roads

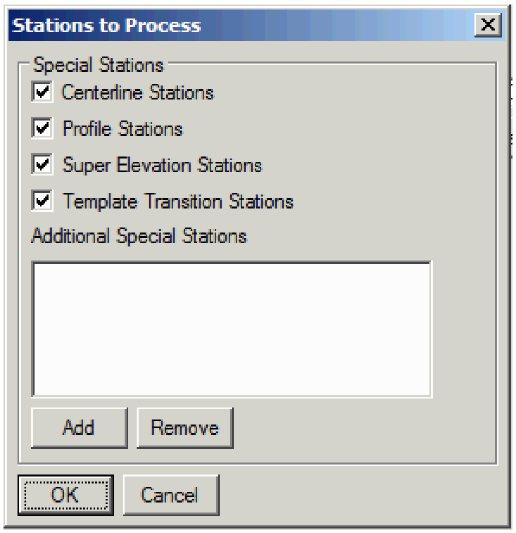
Process Options Tab

Existing Surface: Use this button to browse to and select the Existing Surface file to be used for the Road Network. Either a TIN or FLT triangulation file are accepted as valid surfaces, both of which can be made within the command Triangulate and Contour. For speed, it is recommended that the binary TIN file format be selected.

Rock Surface: Use this button to set the Rock Surface file to be used for the Road Network. This Rock Surface is optional. When the Rock surface is specified, the program will report rock quantities with the cut. Also, the cut definition in the road template file can have a separate slope to the rock surface.

Station Interval: These settings determine the distance between cross-section samples. The user has the option of specifying one sampling interval for the Intersection and another for the remainder of the Road.

Existing Section Max Offset: Use this setting to specify the furthest distance left and right of the Centerline that cross-sections are to be sampled.


Stations to Process
Special Stations
Additional Special Stations
Add
Remove
OK
Cancel

☑ Centerline Stations

☑ Profile Stations

☑ Super Elevation Stations

☑ Template Transition Stations

Special Stations: This button displays the **Stations to Process** dialog box (shown above). This box allows the user to decide whether or not cross-sections are to be sampled at critical design points along each Centerline. **Special**

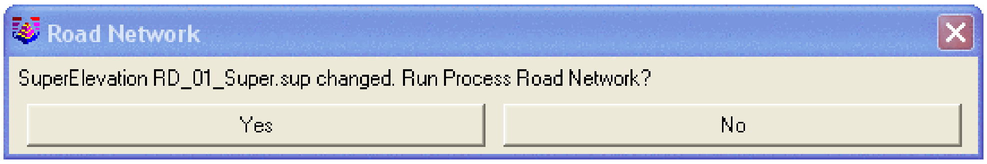
Stations include critical points such as the PC & PT for Centerlines and the PVC, PVT, High Point and Low Point for Profiles. "Additional Special Stations" may be added by entering the station number. These settings apply to ***all Roads*** in the Road Network. To identify **Special Stations** for a particular Road, pick the **Special Stations** button in the **Edit Road** dialog box.

Process On Updated Design Files: This setting has 3 options: ***Off***, ***Prompt*** and ***Auto***:

Off: This option allows changes to the design files without triggering an automatic update to the entire Road Network.

Prompt: This option automatically prompts the user, **"Process Road Network?"** when design files are changed.

Auto: This option automatically updates the Road Network any time a design file is changed.



SuperElevation RD_01_Super.sup changed. Run Process Road Network?

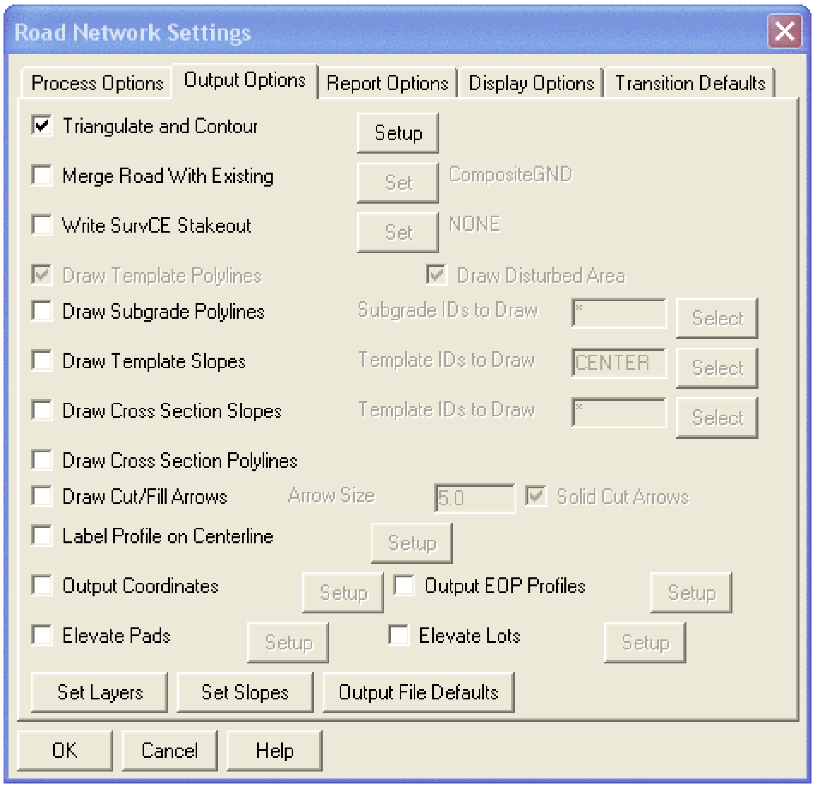
Prompt to Process Updated Road Network Design

Slope Perpendicular To: This setting allows the user to specify the direction of cut and fill slope projection by selecting one of two options: ***Centerline*** and ***Slope Direction***. The ***Centerline*** method projects the cut and fill slopes perpendicular to the Centerline of the Road without regard to the Profile of the Road. The ***Slope Direction*** method considers the Profile of the Road when projecting the specified cut and fill slopes. For example, projecting cut and fill slopes of 2:1, perpendicular to the Centerline, along a length of Road with a Profile slope of 10% would result in a slightly steeper slope (1.96:1) if measured along the top or toe of that slope. If the same conditions exist but the ***Slope Direction*** method is applied, the resulting slope (when measured perpendicular to the Centerline) is slightly less steep (2.04:1) but when measured along the top or toe of slope will be exactly 2:1.

Tie to Existing: If enabled and cut and fill slopes have been defined in the Template (.TPL) file, this setting will project the specified slopes to the Existing Ground surface. If not enabled, the Road design will stop at the last **Template ID** preceding the cut and fill slopes.

Process Intersections: If enabled this option will calculate all Roads and Intersections. If it is not enabled, each Road will be processed individually.

Connect Roads: This option applies to the 3D polylines/breaklines that are created when Processing the Road Network. If this option is enabled, the 3D polylines for different Roads will be combined around and through Intersections. If it is not enabled, the polylines will be drawn for each Road separately.


Road Network Settings
Process Options
Output Options
Report Options
Display Options
Transition Defaults
Setup
Set
Set
Select
Select
Select
Setup
Setup
Setup
Setup
Setup
Set Layers
Set Slopes
Output File Defaults
OK
Cancel
Help

☑ Triangulate and Contour

☐ Merge Road With Existing — CompositeGND

☐ Write SurvCE Stakeout — NONE

☑ Draw Template Polylines ☑ Draw Disturbed Area

☐ Draw Subgrade Polylines — Subgrade IDs to Draw: *

☐ Draw Template Slopes — Template IDs to Draw: CENTER

☐ Draw Cross Section Slopes — Template IDs to Draw: *

☐ Draw Cross Section Polylines

☐ Draw Cut/Fill Arrows — Arrow Size: 5.0 ☑ Solid Cut Arrows

☐ Label Profile on Centerline

☐ Output Coordinates ☐ Output EOP Profiles

☐ Elevate Pads ☐ Elevate Lots

Output Options Tab

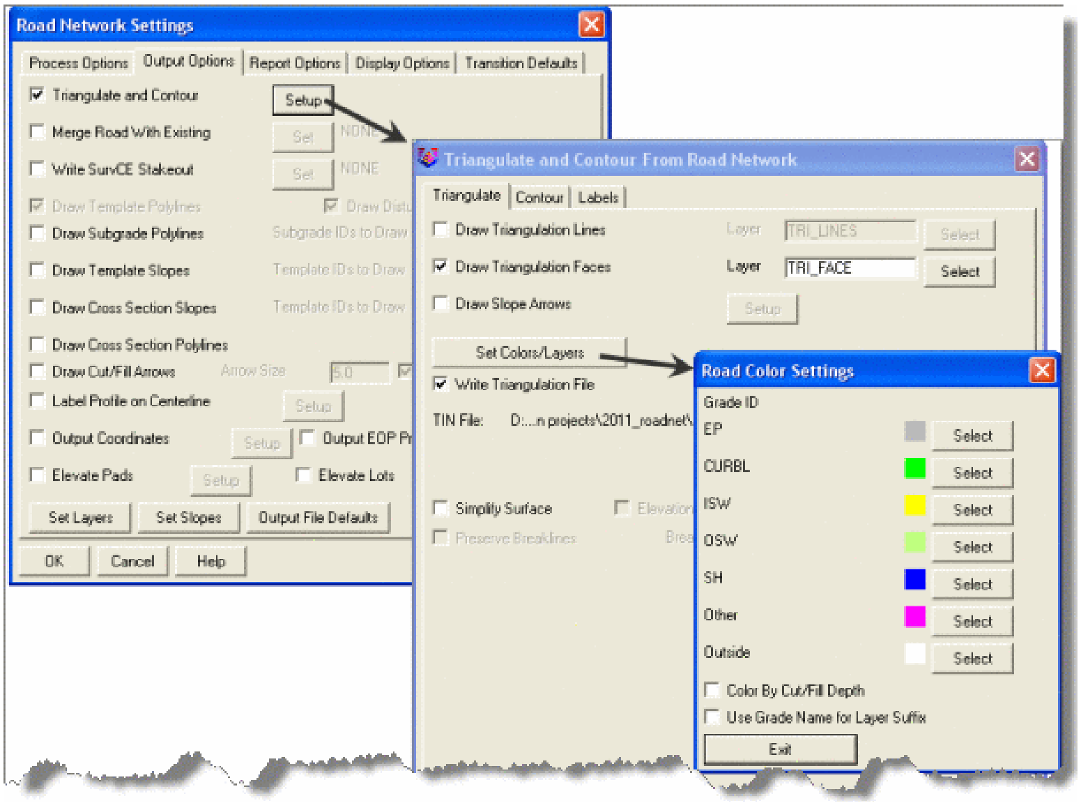
Triangulate and Contour: When enabled, use the **Setup** button to display the **Triangulate and Contour From Road Network** dialog box. Since this command is very similar to the **Surfaces** → **Triangulate and Contour** command, only those Settings and Options directly affecting the Road Network will be discussed here. Please refer to the **Help** files for that command if additional assistance is needed.

In the Triangulate and Contour From Road Network dialog box...

Triangulate **tab**

Draw Triangulation Faces: The **Road Network** version of this command provides additional controls (beyond those in the standard **Triangulate and Contour** command) for managing the color of the "Triangulation Faces". Once the "Triangulation Faces" option is enabled, the **Set Colors/Layers** button becomes active and, when picked, will display the **Road Color Settings** dialog box (shown below). The color of the faces can be set either by using the **Template IDs** defined in the Template (.TPL) file or using a color range based on the "Cut & Fill Depths" that uses a range of Reds and Blues to show areas and depths of Cut and Fill for the proposed Road Network. After the Road Network has been Processed, these shaded faces can be viewed using the **3D Viewer Window** command. Also within Triangulate & Contour, there is **Draw Slope Arrows** to create arrows in the drawing to show the direction of each triangular "plate" in the Road Network TIN. This can be helpful to visualize where water will be flowing.

Write Triangulation File: Once enabled, use the **Browse** button to specify the path and filename for the roadway design Surface (.TIN) file.


Road Network Settings

Process Options | Output Options | Report Options | Display Options | Transition Defaults

☑ Triangulate and Contour — Setup
☐ Merge Road With Existing — Set — NONE
☐ Write SurvCE Stakeout — Set — NONE
☑ Draw Template Polylines — ☑ Draw Distu
☐ Draw Subgrade Polylines — Subgrade IDs to Draw
☐ Draw Template Slopes — Template IDs to Draw
☐ Draw Cross Section Slopes — Template IDs to Draw
☐ Draw Cross Section Polylines
☐ Draw Cut/Fill Arrows — Arrow Size 5.0
☐ Label Profile on Centerline — Setup
☐ Output Coordinates — Setup — ☐ Output EOP Pr
☐ Elevate Pads — Setup — ☐ Elevate Lots

Triangulate and Contour From Road Network

Triangulate | Contour | Labels

☐ Draw Triangulation Lines — Layer TRI_LINES — Select
☑ Draw Triangulation Faces — Layer TRI_FACE — Select
☐ Draw Slope Arrows — Setup

☑ Write Triangulation File
TIN File: D:...n projects\2011_roadnet\
☐ Simplify Surface — ☐ Elevation
☐ Preserve Breaklines — Brea

Road Color Settings

Grade ID		
EP	▒	Select
CURBL	🟩	Select
ISW	🟨	Select
OSW	🟩	Select
SH	🟦	Select
Other	🟪	Select
Outside	⬜	Select

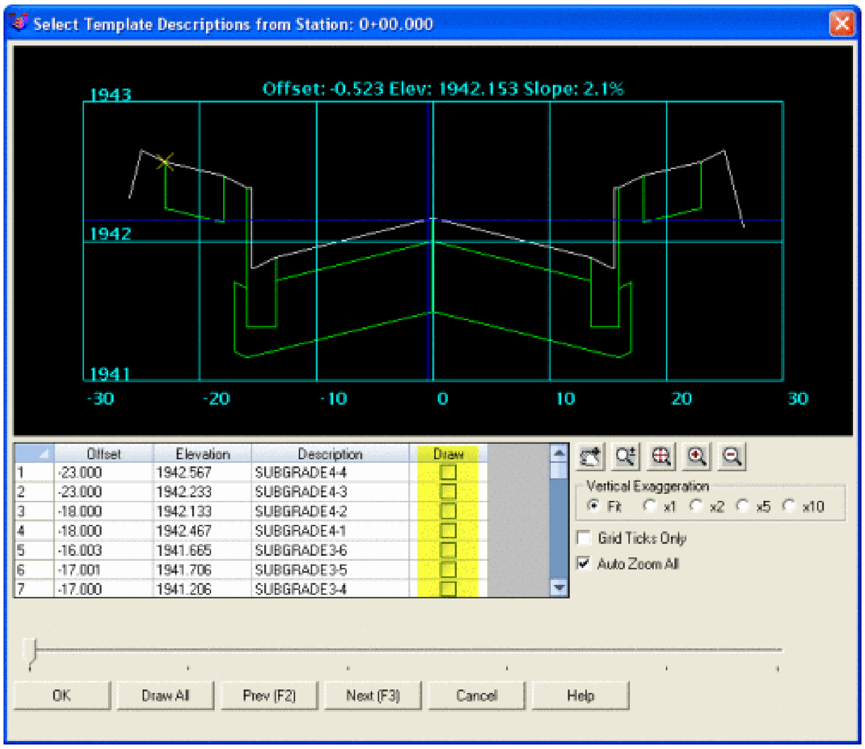
☐ Color By Cut/Fill Depth
☐ Use Grade Name for Layer Suffix

Set Road Colors In the "Triangulate and Contour From Road Network" Dialog Box

Contour **and** ***Labels*** **tabs...**
Use these tabs to define the settings for proposed contours and contour labels.

Output Options (Continued)

Merge Road with Existing: When enabled, use the **Set** button to specify the path and filename of a third Surface (.TIN) file to be created by merging the Existing and roadway design Surface (.TIN) files.
Write SurvCE Stakeout: When enabled, use the **Set** button to specify the path and filename of a SurvCE Stakeout (.RNF) file to be exported. This file can be directly loaded into data collectors using Carlson SurvCE for unlimited field stakeout of the Road Network.
Draw Template Polylines: When enabled, this option will draw all 3D polylines used to generate the roadway design Surface. This option is automatically enabled when the **Triangulate and Contour** option is enabled. The layer for the polylines is set by picking the ***Set Layers*** button in **Output Options**.
Draw Disturbed Area: When enabled, this option will draw a closed, zero-elevation polyline around the limits of disturbance of the roadway design Surface. The layer for the polyline is set by picking the ***Set Layers*** button in **Output Options**.
Draw Subgrade Polylines: When enabled, this option will draw all 3D polylines used to generate the roadway subgrade Surface(s). These polylines can be used to manually generate additional surfaces for modeling, stakeout or machine control purposes. Entering an asterisk ($*$) in the text box will draw polylines for all **Template IDs**. Once a Road has been added to the Network, the **Select** button will be activated. Picking the **Select** button displays a view of the Template (.TPL) file at the starting station and allows the user to **Draw** polylines for selected Subgrade IDs. If needed, the **Next** and **Previous** buttons at the bottom of the window allow the user to browse through the stations of the road design to find a particular Subgrade ID. The layer for the polylines is set by picking the ***Set Layers*** button in **Output Options**.


Select Template Descriptions from Station: 0+00.000

Offset: -0.523 Elev: 1942.153 Slope: 2.1%

	Offset	Elevation	Description	Draw
1	-23.000	1942.567	SUBGRADE4-4	☐
2	-23.000	1942.233	SUBGRADE4-3	☐
3	-18.000	1942.133	SUBGRADE4-2	☐
4	-18.000	1942.467	SUBGRADE4-1	☐
5	-16.003	1941.665	SUBGRADE3-6	☐
6	-17.001	1941.706	SUBGRADE3-5	☐
7	-17.000	1941.206	SUBGRADE3-4	☐

Vertical Exaggeration
● Fit ○ x1 ○ x2 ○ x5 ○ x10

☐ Grid Ticks Only

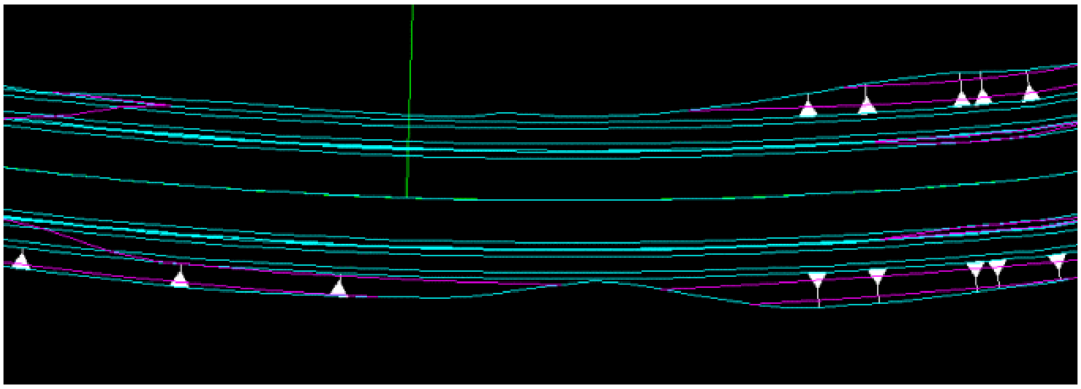
☑ Auto Zoom All

Pick Subgrade Polylines to Be Drawn

Draw Template Slopes: When enabled, this option will draw slope arrows parallel to the Centerline at the selected **Template ID**s. This option may be used to indicate direction and steepness of slope along the flowline of the gutter. Entering an asterisk ($*$) in the text box will draw slope arrows for all **Template ID**s. Once a Road has been added to the Network, the **Select** button will be activated. Picking the **Select** button displays a view of the Template (.TPL) file (similar to the one shown above) and allows the user to **Draw** polylines for selected **Template ID**s. If needed, the **Next** and **Previous** buttons at the bottom of the window allow the user to browse through the stations of the road design to find a particular **Template ID**. The layer for the slope arrows is set by picking the ***Set Layers*** button in **Output Options**. Other slope arrow settings are specified by picking the ***Set Slopes*** button in **Output Options**.

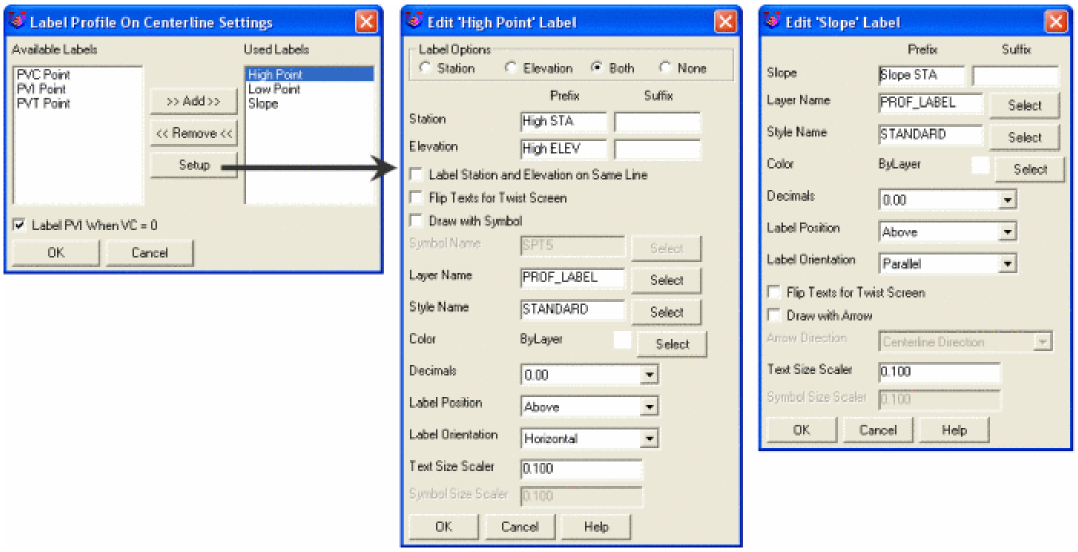
Draw Cross Section Polylines: When enabled, this option will draw a 3D polyline defining the roadway design surface cross-section at each sampled station along the Centerline. These polylines can be used to manually generate additional surfaces for modeling, stakeout or machine control purposes. The layer for the polylines is set by picking the **Set Layers** button in **Output Options**.

Draw Cut/Fill Arrows: When enabled, this option will draw arrows at each sampled cross-section station so that the arrow is pointing down-slope. The example shown below indicates a section of Cut slope transitioning to a section of Fill slope. Once enabled, the user has the ability to adjust the size of the arrows and specify whether or not the Cut/Fill Arrows should be solid.



Cut/Fill Arrows On Slopes

Label Profile on Centerline: When enabled, this option labels Profile slopes and critical points such as PVC, PVT, High and Low Points in plan view along the Centerline. Once enabled, use the **Setup** button to open the **Label Profile on Centerline Settings** dialog. Then, from the list of "Available Labels", select the label(s) to be drawn and use the **Add** button to shift them to the list of "Used Labels". Selecting one of the "Used Labels" and then picking the **Setup** button allows the user to configure the label style and settings for each type of label.



Label Profile On Centerline Settings

Available Labels: PVC Point, PVI Point, PVT Point

Used Labels: High Point, Low Point, Slope

☑ Label PVI When VC = 0

Edit 'High Point' Label

Label Options: ○ Station ○ Elevation ● Both ○ None

	Prefix	Suffix
Station	High STA	
Elevation	High ELEV	

☐ Label Station and Elevation on Same Line
☐ Flip Texts for Twist Screen
☐ Draw with Symbol

Symbol Name: SPT5
Layer Name: PROF_LABEL
Style Name: STANDARD
Color: ByLayer
Decimals: 0.00
Label Position: Above
Label Orientation: Horizontal
Text Size Scaler: 0.100
Symbol Size Scaler: 0.100

Edit 'Slope' Label

	Prefix	Suffix
Slope	Slope STA	

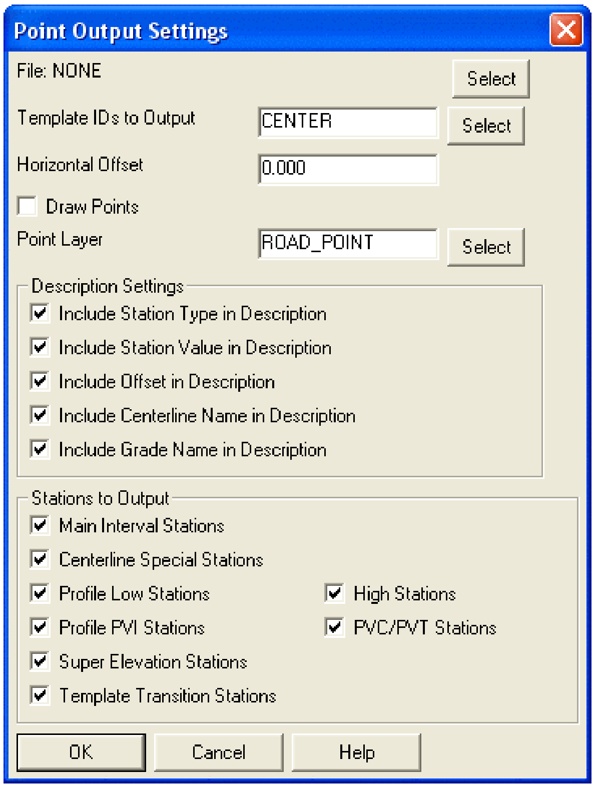
Layer Name: PROF_LABEL
Style Name: STANDARD
Color: ByLayer
Decimals: 0.00
Label Position: Above
Label Orientation: Parallel

☐ Flip Texts for Twist Screen
☐ Draw with Arrow

Arrow Direction: Centerline Direction
Text Size Scaler: 0.100
Symbol Size Scaler: 0.100

Label Profile on Centerline and Label Setup Dialog Boxes

Output Coordinates: When enabled, this option allows the user to export a Coordinate (.CRD) file containing all of the critical points for the Road Network. Once enabled, pick the **Setup** button to specify the path, filename and other criteria for the point file.



Point Output Settings

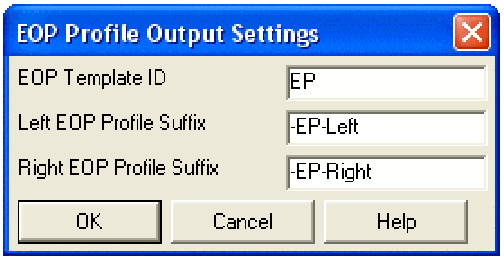
File: NONE
Template IDs to Output: CENTER
Horizontal Offset: 0.000
☐ Draw Points
Point Layer: ROAD_POINT

Description Settings
☑ Include Station Type in Description
☑ Include Station Value in Description
☑ Include Offset in Description
☑ Include Centerline Name in Description
☑ Include Grade Name in Description

Stations to Output
☑ Main Interval Stations
☑ Centerline Special Stations
☑ Profile Low Stations
☑ High Stations
☑ Profile PVI Stations
☑ PVC/PVT Stations
☑ Super Elevation Stations
☑ Template Transition Stations

Point Output Settings Dialog Box

Output EOP Profiles: When enabled, this option creates individual Profile (.PRO) files for the edges of pavement.



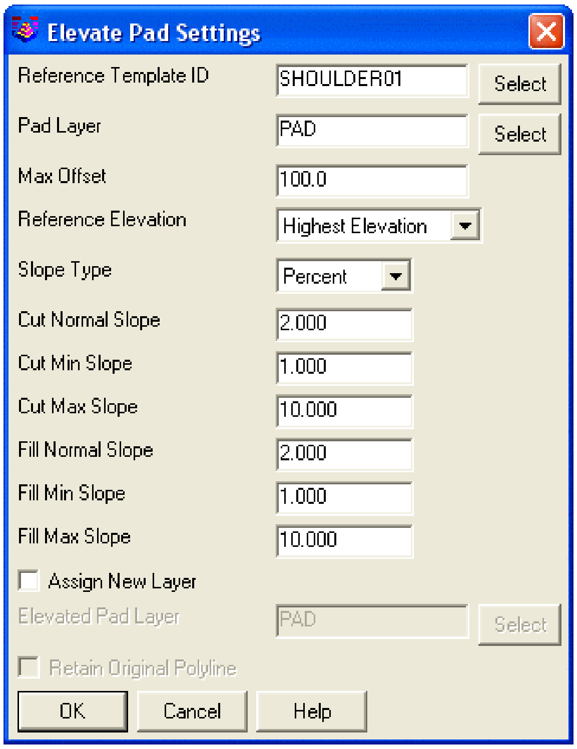
EOP Template ID: EP
Left EOP Profile Suffix: -EP-Left
Right EOP Profile Suffix: -EP-Right

Output EOP Profiles Dialog Box

Elevate Pads: When enabled, this option adjusts the elevation of closed polylines within a specified proximity of the Road Network. Once enabled, use the **Setup** button to open the **Elevate Pad Settings** dialog box and configure the settings.

In the Elevate Pad Settings dialog box...

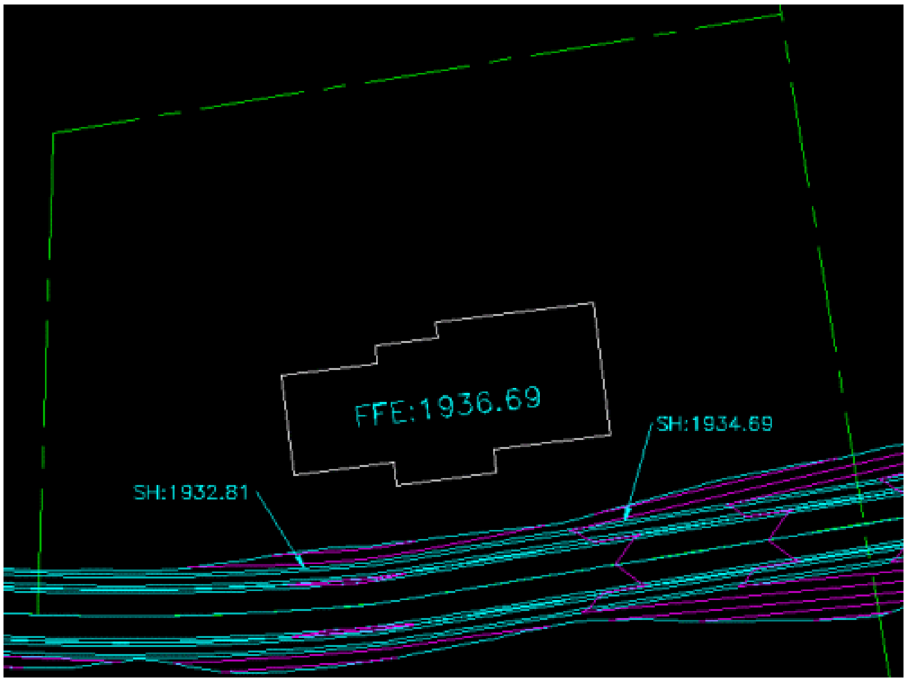
Reference Template ID: When determining the new pad elevation, all distances and elevation changes are based on the **Template ID** specified here. Type the **Template ID** in the text box or use the **Select** button to choose from a list.
Pad Layer: All original polylines found on this layer (and within the Max Offset of the Reference Template ID) will be elevated.
Max Offset: All original polylines within this distance of the Reference Template ID and on the specified "Pad Layer" will be elevated.
Reference Elevation: This setting has 3 options: "Highest Elevation", "Lowest Elevation" and "Elevation at Middle". Of the elevations found along the **Reference Template ID** that are adjacent to the pad polyline, the command will use either the highest, lowest or middle elevation found to set the new pad elevation.
Slope Type: This setting has 3 options: Percent (%), Ratio (x:y) and Vertical (change in elevation).
Cut/Fill, Normal/Min/Max Slopes: For future earthwork balancing adjustments, the settings in this dialog are used to specify the range of allowable slopes when in cut or fill conditions.
Assign New Layer: When enabled, this option allows the user to specify a new layer for the new, elevated pad polyline. Once enabled, either type the new layer name in the text box or use the **Select** button to choose the layer from a list.
Retain Original Polyline: This option is only available if the "Assign New Layer" option is enabled and will keep the original, zero-elevation polyline in addition to the new, elevated polyline. If this option is not enabled, the original polyline will be deleted from the drawing.



Reference Template ID	SHOULDER01
Pad Layer	PAD
Max Offset	100.0
Reference Elevation	Highest Elevation
Slope Type	Percent
Cut Normal Slope	2.000
Cut Min Slope	1.000
Cut Max Slope	10.000
Fill Normal Slope	2.000
Fill Min Slope	1.000
Fill Max Slope	10.000
☐ Assign New Layer	
Elevated Pad Layer	PAD
☐ Retain Original Polyline	

Elevate Pad Settings Dialog Box

In the dialog shown here, all closed polylines on layer PAD that are within 100 feet of the road will have their elevations set based on a 2 percent grade up from the PAVE Template ID point, in either Cut or Fill conditions. In future earthwork balancing adjustments, the polyline can be adjusted a maximum of up to a 10 percent grade or down to a 1 percent grade from the Reference Template ID. The example below shows the results of elevating a pad so that it is 2.0' above (using Vertical option) the highest point along a Reference Template ID of "SH" (Shoulder) on the adjacent Road.



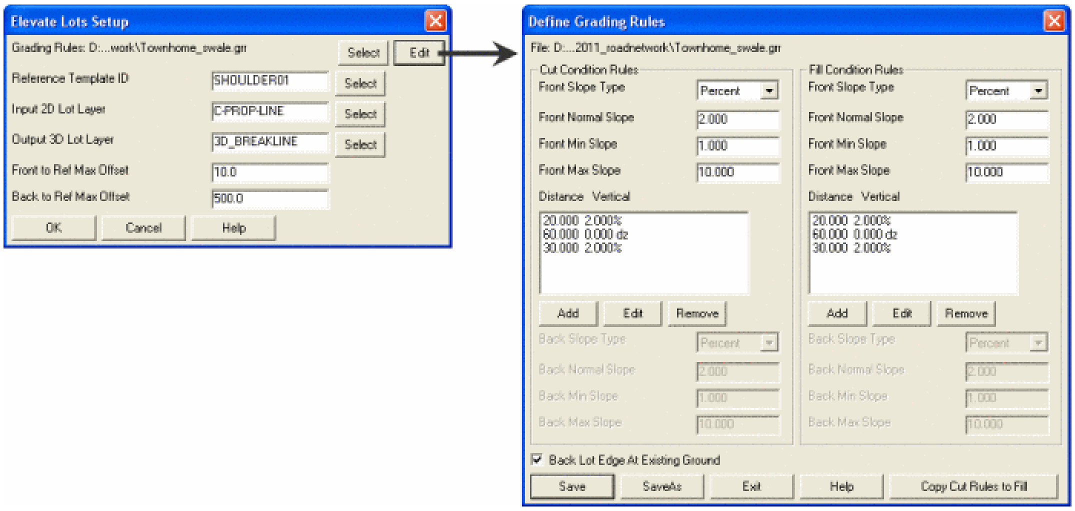
Elevate Pads - Example

Output Options (Continued)

Elevate Lots: When enabled, this option follows a logic similar to that of the **Elevate Pads** routine in that it elevates zero-elevation lot lines relative to a road design and based on a set of grading rules. Once the option is enabled, use the **Setup** button to display the **Elevate Lots Setup** dialog box.

In the Elevate Lots Setup dialog box...

Grading Rules: The necessity of a Grading Rules (.GRR) file is the key difference between elevating pads and elevating lots. If a Grading Rules (.GRR) file has already been prepared, use the **Select** button to browse to and select the file. To create a new file, pick the **Edit** button to open the **Define Grading Rules** dialog box and specify the desired settings. Then, pick the **SaveAs** button to **Save** a Grading Rules (.GRR) file. **Define Grading Rules** is a command that also exists outside of the **Road Network** feature. Please refer to the **Help** files for that command if additional assistance is needed.
Reference Template ID: When determining the elevations for the new lot line, all distances and elevation changes are based on the **Template ID** specified here. Type the **Template ID** in the text box or use the **Select** button to choose from a list.
Input 2D Lot Layer: All original polylines found on this layer (and within the Max Offset of the Reference Template ID) will be elevated. Either type the layer name in the text box or use the **Select** button to choose the layer name.
Output 3D Lot Layer: This is the layer to which the newly elevated lot lines will be assigned. Either type the layer name in the text box or use the **Select** button to choose the layer name.
Front to Ref Max Offset: Use this setting to specify a distance from the **Reference Template ID** beyond which Lot Frontage polylines will not be elevated.
Back to Ref Max Offset: Use this setting to specify a distance from the **Reference Template ID** beyond which Back/Rear Lot polylines will not be elevated.



Grading Rules: D:...work\Townhome_swale.grr
Reference Template ID: SHOULDER01
Input 2D Lot Layer: C-PROP-LINE
Output 3D Lot Layer: 3D_BREAKLINE
Front to Ref Max Offset: 10.0
Back to Ref Max Offset: 500.0

File: D:...2011_roadnetwork\Townhome_swale.grr

Cut Condition Rules
Front Slope Type: Percent
Front Normal Slope: 2.000
Front Min Slope: 1.000
Front Max Slope: 10.000
Distance Vertical
20.000 2.000%
60.000 0.000 dz
30.000 2.000%
Back Slope Type: Percent
Back Normal Slope: 2.000
Back Min Slope: 1.000
Back Max Slope: 10.000

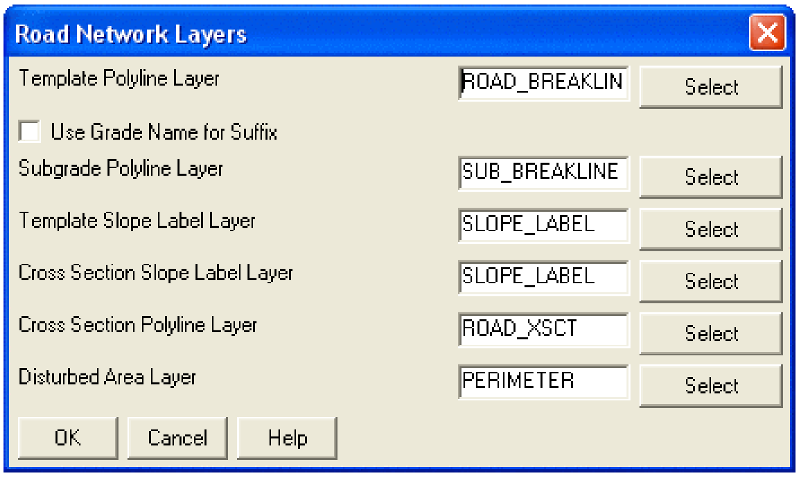
Fill Condition Rules
Front Slope Type: Percent
Front Normal Slope: 2.000
Front Min Slope: 1.000
Front Max Slope: 10.000
Distance Vertical
20.000 2.000%
60.000 0.000 dz
30.000 2.000%
Back Slope Type: Percent
Back Normal Slope: 2.000
Back Min Slope: 1.000
Back Max Slope: 10.000

☑ Back Lot Edge At Existing Ground

Elevate Lots and Define Grading Rules Dialog Boxes

Output Options (Continued)

Set Layers: Pick this button to display the **Road Network Layers** dialog box.


Road Network Layers

Template Polyline Layer ROAD_BREAKLIN

☐ Use Grade Name for Suffix

Subgrade Polyline Layer SUB_BREAKLINE

Template Slope Label Layer SLOPE_LABEL

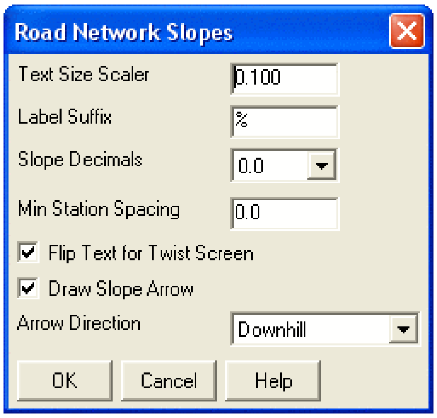
Cross Section Slope Label Layer SLOPE_LABEL

Cross Section Polyline Layer ROAD_XSCT

Disturbed Area Layer PERIMETER

Road Network Layers Dialog Box

Set Slopes: Pick this button to display the **Road Network Slopes** dialog box and configure the settings for drawing slope arrows.


Road Network Slopes

Text Size Scaler 0.100

Label Suffix %

Slope Decimals 0.0

Min Station Spacing 0.0

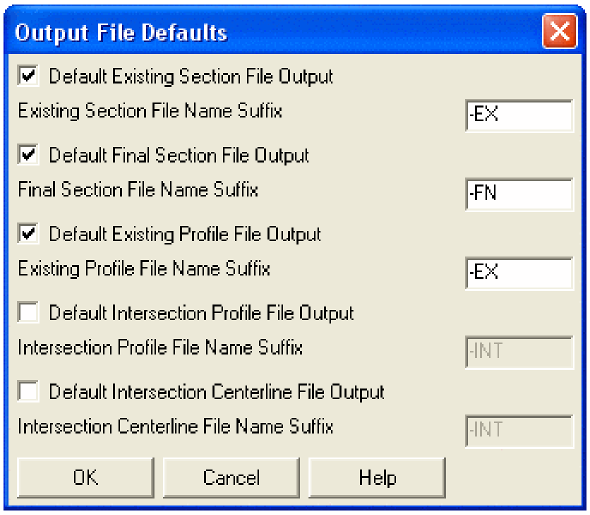
☑ Flip Text for Twist Screen

☑ Draw Slope Arrow

Arrow Direction Downhill

Road Network Slopes Dialog Box

Output File Defaults: Pick this button to specify additional Centerline (.CL), Profile (.PRO) and Section (.SCT) files to be saved when Processing the Road Network.


Output File Defaults

☑ Default Existing Section File Output

Existing Section File Name Suffix -EX

☑ Default Final Section File Output

Final Section File Name Suffix -FN

☑ Default Existing Profile File Output

Existing Profile File Name Suffix -EX

☐ Default Intersection Profile File Output

Intersection Profile File Name Suffix -INT

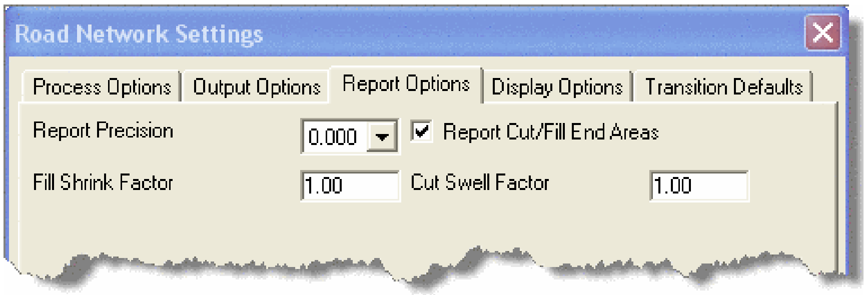
☐ Default Intersection Centerline File Output

Intersection Centerline File Name Suffix -INT

Output File Defaults Dialog Box

Settings on this tab allow the user to specify defaults for the Road Network **Report** feature. This feature is

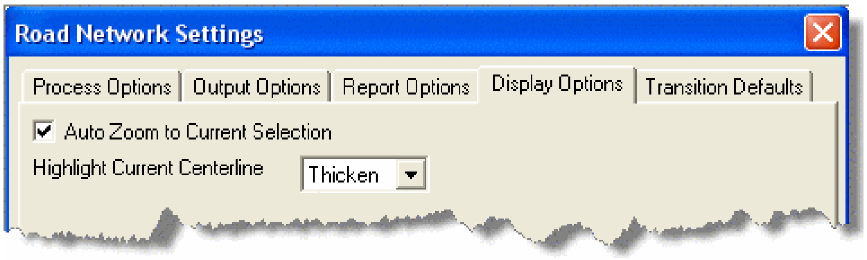
accessible from the **Report** button of the **Road Network: Task Pane**.
Report Precision: Specify the decimal precision for the report.
Use Report Formatter: This option allows for customized report layout and contents. Otherwise a standard report is displayed.
Report Cut/Fill End Areas: Specify whether or not to report cut/fill at each station.
Report Cut/Fill Differences: Adds a running total of the cut to fill balance at each station to the report.
Report Cumulative Cut/Fill: Adds a running total of the cut/fill at each station to the report.
Fill Shrink/Cut Swell Factor: Allows you to specify a value that the volume calculated will be multiplied by.



Report Precision 0.000
☑ Report Cut/Fill End Areas
Fill Shrink Factor 1.00
Cut Swell Factor 1.00

Report Options Tab

Settings on this tab allow the user to configure special display characteristics in order to identify the Road, Intersection or Cul-de-Sac selected in the **Road Network: Task Pane**.

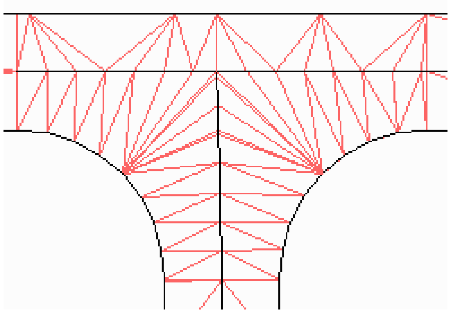


☑ Auto Zoom to Current Selection
Highlight Current Centerline Thicken

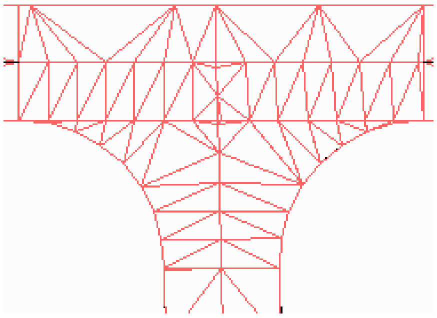
Display Options Tab

Settings in this tab allow the user to specify the default values used for transitioning from Road to Road, from Road to Intersection and from Road to Cul-de-Sac.

CL Intersections: Use this setting to define the default transition distance and vertical curve length for intersecting Centerlines. See **Road Network: Adding and Editing Intersections** for more.
Side Intersections: Use this setting to define the default vertical curve length for the Profile and the default radius for Corners at Intersections. See **Road Network: Adding and Editing Intersections** for more.
Surface Method: When calculating Intersections, there are two options for handling the cross-sections of the intersecting Roads: "Hold Main Crown", which honors the Primary Road Template through the Intersection, or "Radial from Curb", which grades between the Centerline Profile and the Profile of each Corner of the Intersection. The Profile for the Corner may be defined as the edge of pavement (EP), back of curb (BC) or other point on the cross-section by specifying the **Template ID** in the **Settings** tab of the **Edit Intersection** dialog box.

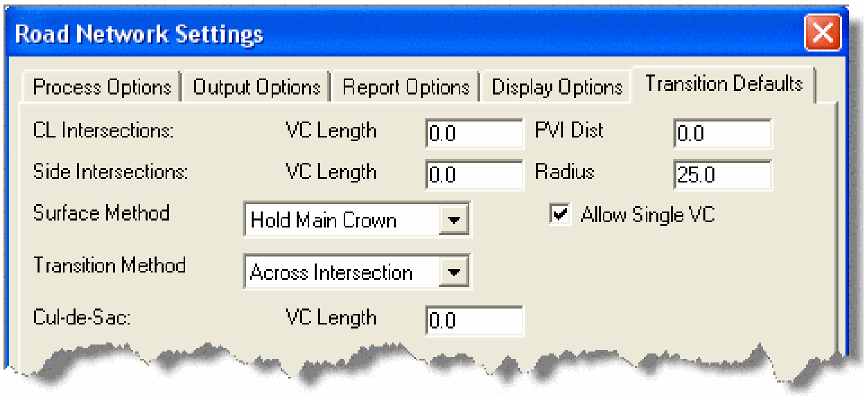


Surface Method: Radial From Curb



Surface Method: Hold Main Crown

Transition Method: This setting applies when a Road has a varying width through an Intersection. The "Across Intersection" option looks at the Primary Road (from start to end of the Intersection) to find the maximum offset distance between the Centerline and edge of pavement, and uses this distance to set the edge of pavement breakline across the Intersection with the Secondary Road. The "Mid Point" option simply finds the pavement width at the Intersection station and uses this distance to set the edge of pavement breakline across the Intersection.
Cul-de-Sac: Use this setting to define the default vertical curve length along the Cul-de-Sac Profile.



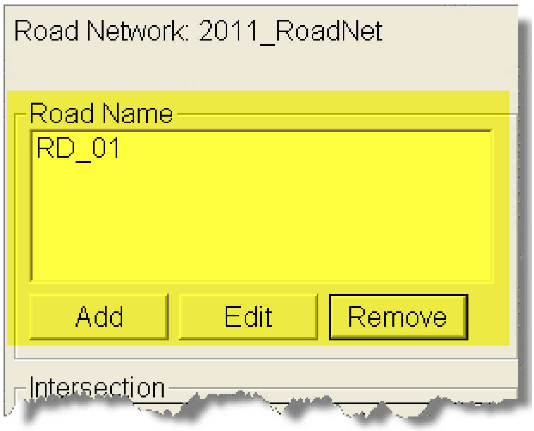
CL Intersections: VC Length 0.0 PVI Dist 0.0
Side Intersections: VC Length 0.0 Radius 25.0
Surface Method Hold Main Crown ☑ Allow Single VC
Transition Method Across Intersection
Cul-de-Sac: VC Length 0.0

Transition Defaults Tab

Roads in a Road Network are managed in the **Road Name** area of the **Road Network: Task Pane**.

Add: Pick this button to **Add** a Road to the Network. After adding the Road, the **Edit Road** dialog box is displayed allowing the user to manage and make changes to the **Input Files** and **Output Files** for the selected Road.
Edit: Pick this button to display the **Edit Road** dialog box to manage and make changes to the **Input Files** and **Output Files** for the selected Road.
Remove: Pick this button to delete the selected Road from the Road Network. After Removing the Road from the Network the design files associated with that Road will remain in the project folder.

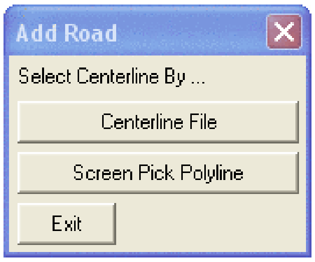
Adding a new Road may be done either by selecting a pre-defined Centerline (.CL) file or by screen-picking a 2D Polyline in the drawing and assigning a new Centerline (.CL) file to it.


Road Network: 2011_RoadNet
Road Name
Add
Edit
Remove
Intersection

RD_01

Road Name Area of the Road Network Task Pane

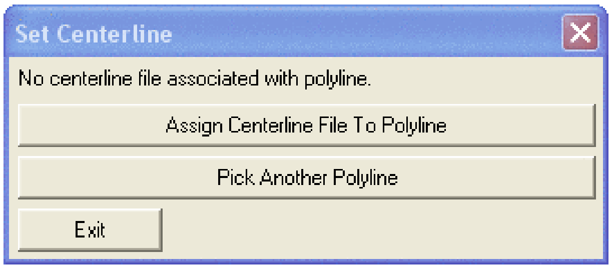
Add: Use this button to **Add** a Road to the Road Network. After picking the **Add** button, the **Add Road** dialog box gives the user the option to "Select Centerline By..." **Centerline File** or **Screen Pick Polyline**. If the **Centerline File** option is chosen, the user is prompted to browse to and select the Centerline (.CL) file.


Add Road
Centerline File
Screen Pick Polyline
Exit

Select Centerline By ...

Specify Method to Use to Add Road

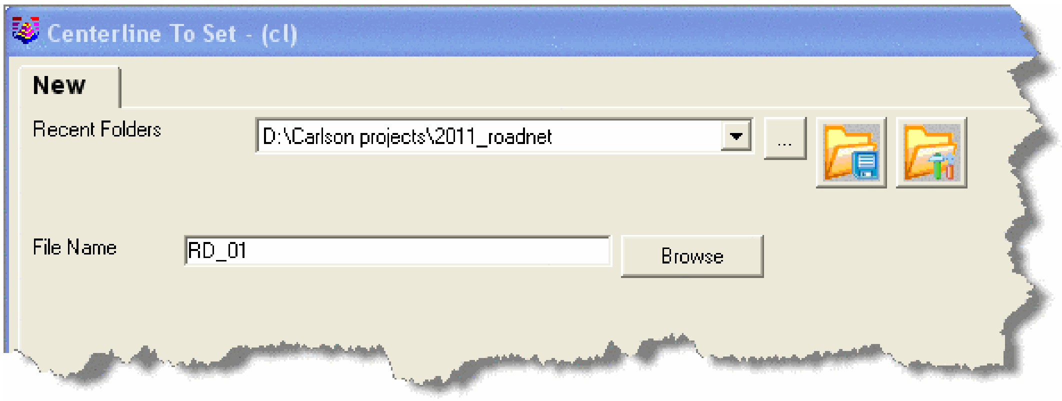
If the **Screen Pick Polyline** option is chosen, the user is prompted to select a polyline in the drawing. If an associated Centerline (.CL) file is not found in the project folder, the **Set Centerline** dialog notifies the user that, "No centerline file associated with polyline..." and the user must choose to either select another polyline or to **Assign Centerline File to Polyline**.


Set Centerline
Assign Centerline File To Polyline
Pick Another Polyline
Exit

No centerline file associated with polyline.

Set Centerline Dialog Box

After picking the **Assign Centerline File to Polyline** button, the **Centerline to Set** file dialog box prompts the user to assign a path and filename for the new Centerline (.CL) file.

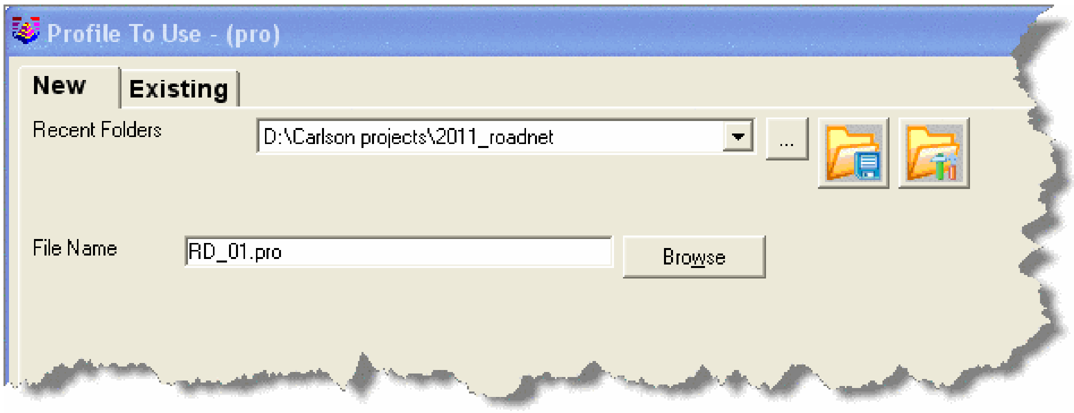


Recent Folders: D:\Carlson projects\2011_roadnet

File Name: RD_01

Centerline to Set File Dialog Box

Immediately upon defining the new Road, the **Profile to Use** file dialog box prompts the user to assign a path and filename for the proposed Profile (.PRO) file for the Road. By default, the new Profile (.PRO) file is named the same as the Centerline (.CL) file.

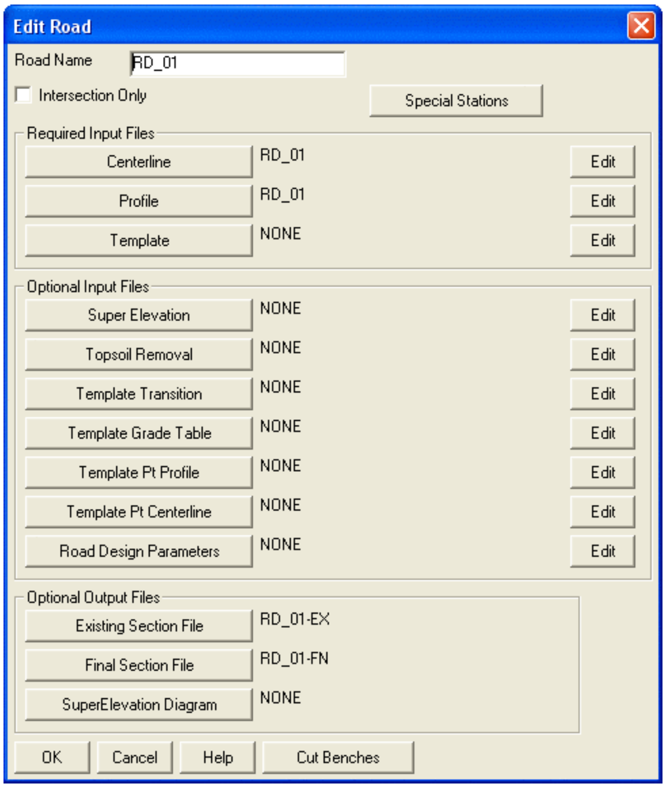


Recent Folders: D:\Carlson projects\2011_roadnet

File Name: RD_01.pro

Profile to Use File Dialog Box

After specifying the Centerline (.CL) and Profile (.PRO) files for the Road, the **Edit Road** dialog box is displayed. This dialog serves as the "manager" for all files relating to the specific Road. The **Edit Road** dialog box allows the user to apply settings and associate various files that are specific to the Road - not the entire Road Network. The **Edit** button in the **Road Name** section of the **Road Network: Task Pane** also displays this dialog box.

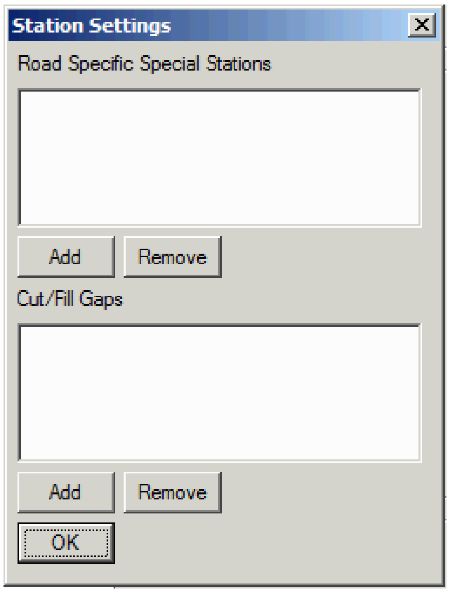

Edit Road
Road Name
☐ Intersection Only
Special Stations
Required Input Files
Centerline
Profile
Template
Edit
Optional Input Files
Super Elevation
Topsoil Removal
Template Transition
Template Grade Table
Template Pt Profile
Template Pt Centerline
Road Design Parameters
Optional Output Files
Existing Section File
Final Section File
SuperElevation Diagram
OK
Cancel
Help
Cut Benches

Road Name: RD_01

Centerline	RD_01	Edit
Profile	RD_01	Edit
Template	NONE	Edit
Super Elevation	NONE	Edit
Topsoil Removal	NONE	Edit
Template Transition	NONE	Edit
Template Grade Table	NONE	Edit
Template Pt Profile	NONE	Edit
Template Pt Centerline	NONE	Edit
Road Design Parameters	NONE	Edit
Existing Section File	RD_01-EX	
Final Section File	RD_01-FN	
SuperElevation Diagram	NONE	

Edit Road Dialog Box

Intersection Only: If this option is enabled, Road Network will only consider the portions of this Road that intersect with other Roads when calculating the design.
Station Settings: Pick this button to display for special stations and cut/fill gaps.
Special Stations: Enter one or more stations at which to sample cross-sections.
Cut/Fill Gaps: Use the Add and Remove buttons to define a series of station ranges for cut/fill gaps where the program will not calculate any volumes or apply the template cut/fill tie slopes. For example, these stations could be used across a bridge.

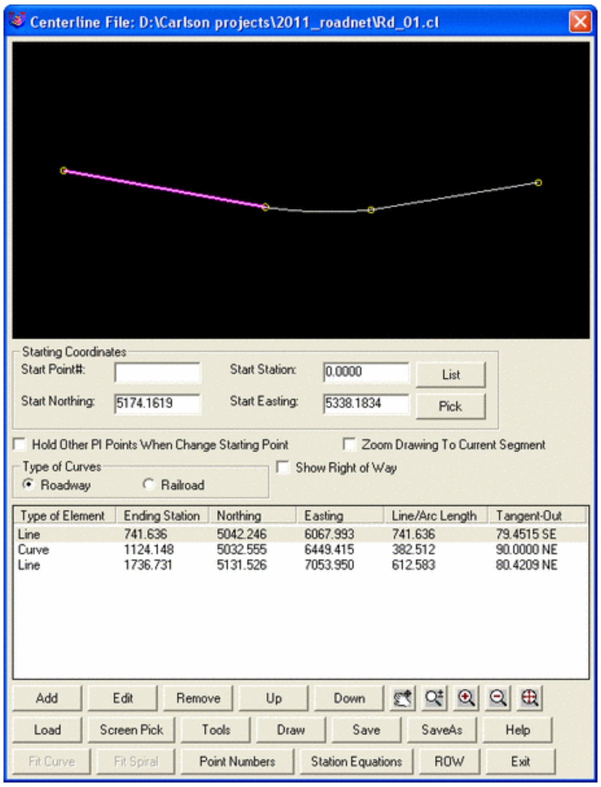

Station Settings
Road Specific Special Stations
Add
Remove
Cut/Fill Gaps
Add
Remove
OK

Add Road Specific Special Stations

A Centerline (.CL) file, a Profile (.PRO) file and a Template (.TPL) File are ***required*** in order to process a roadway design using the **Road Network** feature. In addition, the **Road Network** feature accepts several additional files for designing Roads using specific criteria. In the **Edit Road** dialog box, picking the buttons on the left, that are labeled with the file type, will display a file dialog box prompting the user to select an existing or create a new file of that type. The corresponding **Edit** button to the right of each file type will display the editor for that file type.

Required Road Input Files

Centerline: Pick this button to select an existing or create a new Centerline (.CL) file from which to define the horizontal alignment of the Road. The **Edit** button opens the **Centerline File** Editor. This Editor is the same as the one used for the **Input-Edit Centerline File** command. Please refer to the **Help** files for that command if additional assistance is needed.



Centerline File: D:\Carlson projects\2011_roadnet\Rd_01.cl

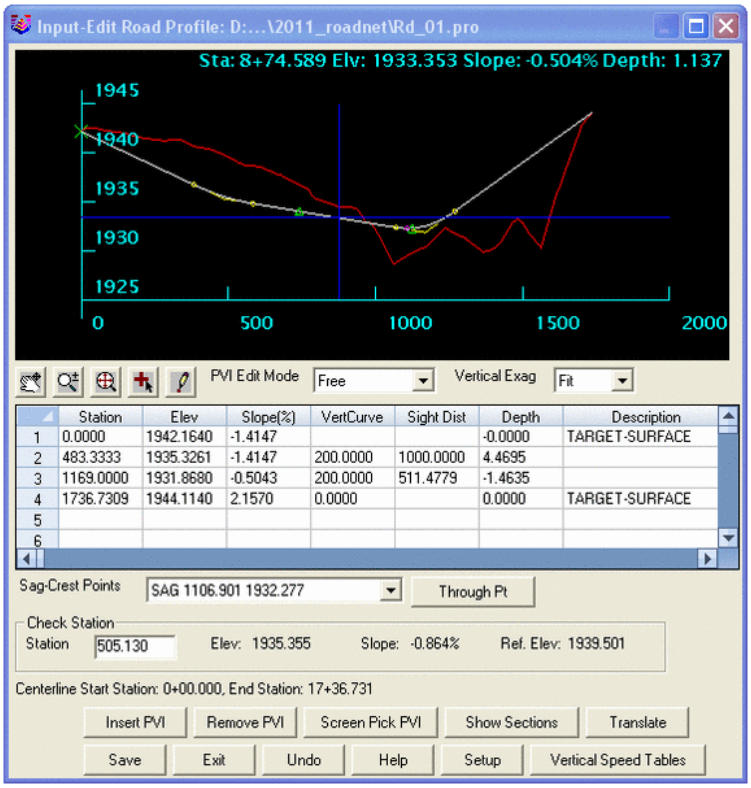
Starting Coordinates
Start Point#:
Start Station: 0.0000
Start Northing: 5174.1619
Start Easting: 5338.1834

☐ Hold Other PI Points When Change Starting Point
☐ Zoom Drawing To Current Segment
Type of Curves
● Roadway ○ Railroad
☐ Show Right of Way

Type of Element	Ending Station	Northing	Easting	Line/Arc Length	Tangent-Out
Line	741.636	5042.246	6067.993	741.636	79.4515 SE
Curve	1124.148	5032.555	6449.415	382.512	90.0000 NE
Line	1736.731	5131.526	7053.950	612.583	80.4209 NE

Centerline File Editor

Profile: Pick this button to select an existing or create a new design Profile (.PRO) file for the Road. The **Edit** button opens the **Input-Edit Road Profile** Editor. The Editor provides the user with both a "profile-grid-view" and a "table-view" of the Profile (.PRO) file. See **Road Network: Road Profile Editor** for more.


Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro

Sta: 8+74.589 Elv: 1933.353 Slope: -0.504% Depth: 1.137

PVI Edit Mode: Free

Vertical Exag: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	-1.4147			-0.0000	TARGET-SURFACE
2	483.3333	1935.3261	-1.4147	200.0000	1000.0000	4.4695	
3	1169.0000	1931.8680	-0.5043	200.0000	511.4779	-1.4635	
4	1736.7309	1944.1140	2.1570	0.0000		0.0000	TARGET-SURFACE
5							
6							

Sag-Crest Points: SAG 1106.901 1932.277

Check Station

Station: 505.130 Elev: 1935.355 Slope: -0.864% Ref. Elev: 1939.501

Centerline Start Station: 0+00.000, End Station: 17+36.731

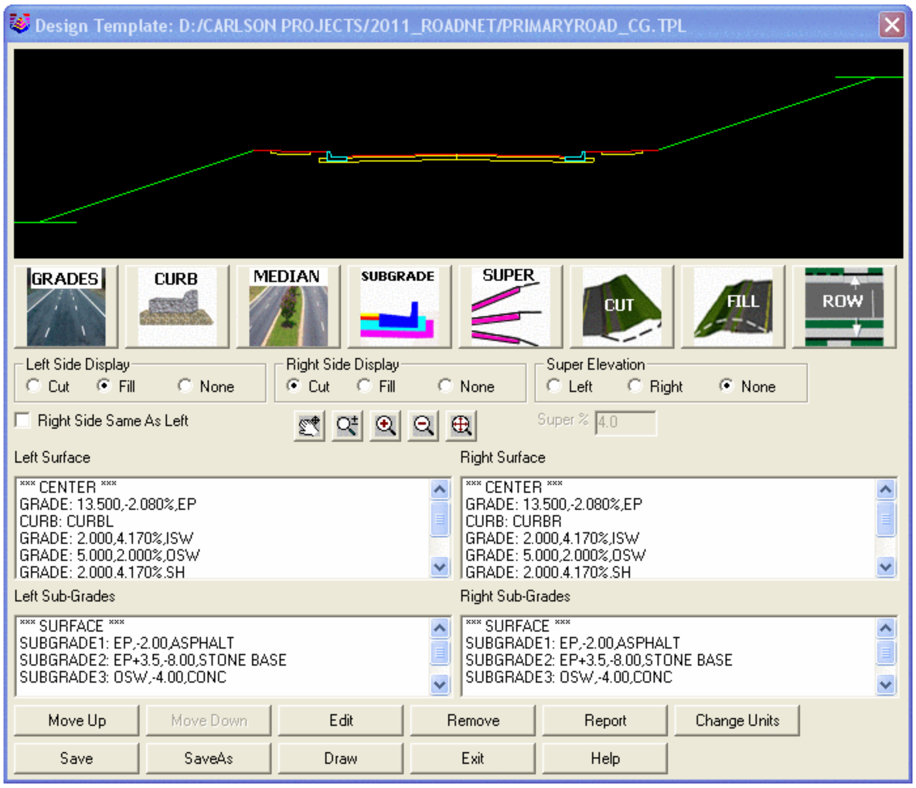
Input-Edit Road Profile Editor

Template: Pick this button to select an existing or create a new Template (.TPL) file or Template Series (.TSF) file for the Road.

A Template (.TPL) file defines a typical roadway cross-section including pavement, curb, ditches, medians, super-elevations, subgrades, rights-of-way and cut/fill slopes. One of the most critical steps in defining a Road Template for use with the **Road Network** feature is the assigning of a **Template ID** to points on the Template. A **Template ID** is a unique name for each point on the Template and is used to transition from Road to Road, from Road to Intersection and Road to Cul-de-Sac. The **Template ID** serves 4 purposes: (1) the ID will be applied as a description to all final Template points generated in the form of a Coordinate (.CRD) file, (2) the ID can be used as a design point in the Template definition, as in EP+5 indicating 5 feet or meters right of edge of pavement, (3) points of common ID may be connected by 3D polylines in the **Output Options** tab of the **Road Network: Settings** dialog box and (4) Quantities can be generated with reference to the ID and material (gravel, concrete, etc.) also defined in the Template (.TPL) file.

A Template Series (.TSF) file references Template (.TPL) files for Template-to-Template transitioning and is one method used for widening and narrowing of Road sections.

Picking the **Edit** button will open the appropriate **Design Template** or **Input-Edit Template Series File** Editor. These Editors are the same as those used for the **Draw Typical Template** and **Template Transition** commands. Please refer to the **Help** files for those commands if additional assistance is needed.


GRADES
CURB
MEDIAN
SUBGRADE
SUPER
CUT
FILL
ROW
Move Up
Move Down
Edit
Remove
Report
Change Units
Save
SaveAs
Draw
Exit
Help

Design Template: D:/CARLSON PROJECTS/2011_ROADNET/PRIMARYROAD_CG.TPL

Left Side Display ○ Cut ● Fill ○ None

Right Side Display ● Cut ○ Fill ○ None

Super Elevation ○ Left ○ Right ● None

☐ Right Side Same As Left

Super % 4.0

Left Surface

```
*** CENTER ***
GRADE: 13.500,-2.080%,EP
CURB: CURBL
GRADE: 2.000,4.170%,ISW
GRADE: 5.000,2.000%,OSW
GRADE: 2.000,4.170%,SH
```

Right Surface

```
*** CENTER ***
GRADE: 13.500,-2.080%,EP
CURB: CURBR
GRADE: 2.000,4.170%,ISW
GRADE: 5.000,2.000%,OSW
GRADE: 2.000,4.170%,SH
```

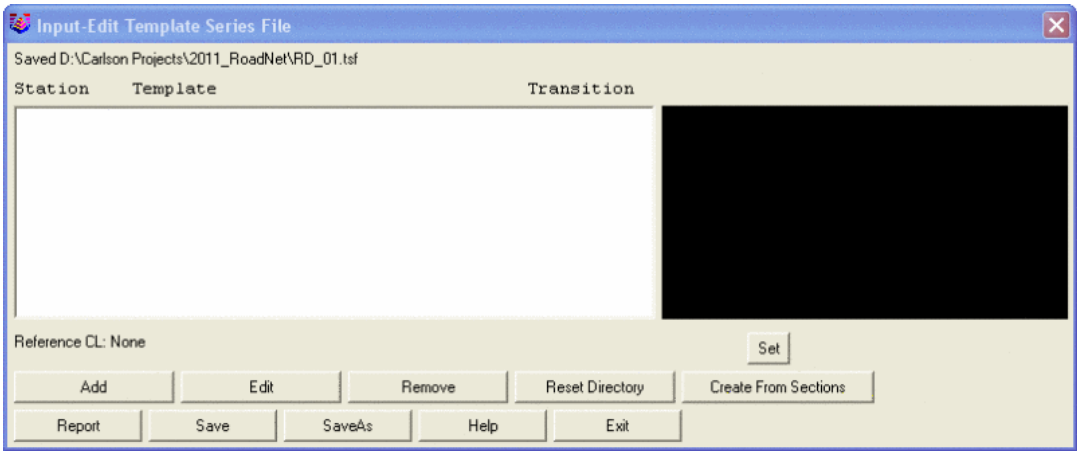
Left Sub-Grades

```
*** SURFACE ***
SUBGRADE1: EP,-2.00,ASPHALT
SUBGRADE2: EP+3.5,-8.00,STONE BASE
SUBGRADE3: OSW,-4.00,CONC
```

Right Sub-Grades

```
*** SURFACE ***
SUBGRADE1: EP,-2.00,ASPHALT
SUBGRADE2: EP+3.5,-8.00,STONE BASE
SUBGRADE3: OSW,-4.00,CONC
```

Design Template Editor


Station
Template
Transition
Set
Add
Edit
Remove
Reset Directory
Create From Sections
Report
Save
SaveAs
Help
Exit

Input-Edit Template Series File

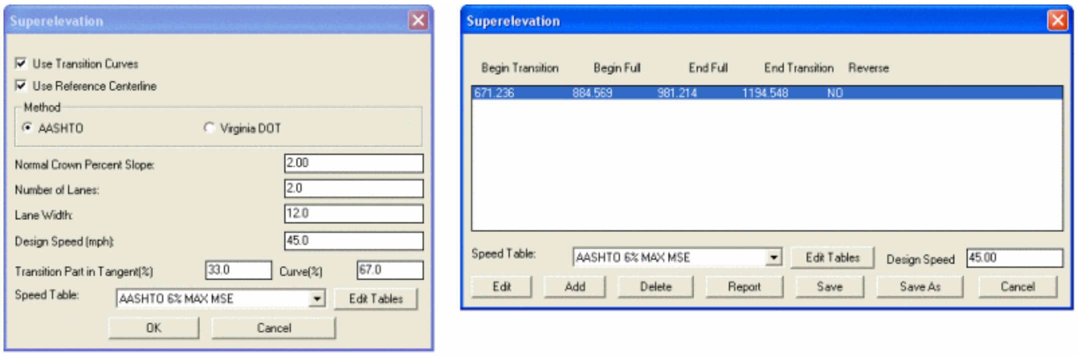
Saved D:\Carlson Projects\2011_RoadNet\RD_01.tsf

Reference CL: None

Input-Edit Template Series Editor

Optional Road Input Files

Super Elevation: Pick this button to select an existing or create a new SuperElevation (.SUP) file for the Road. The **Edit** button opens the **Super Elevation** Editor. This Editor is the same as the one used for the **Input-Edit Super Elevation** command. Please refer to the **Help** files for that command if additional assistance is needed.


Superelevation
OK
Cancel
Edit Tables
Superelevation
Edit
Add
Delete
Report
Save
Save As
Cancel
Edit Tables

☑ Use Transition Curves
☑ Use Reference Centerline

Method: ● AASHTO ○ Virginia DOT

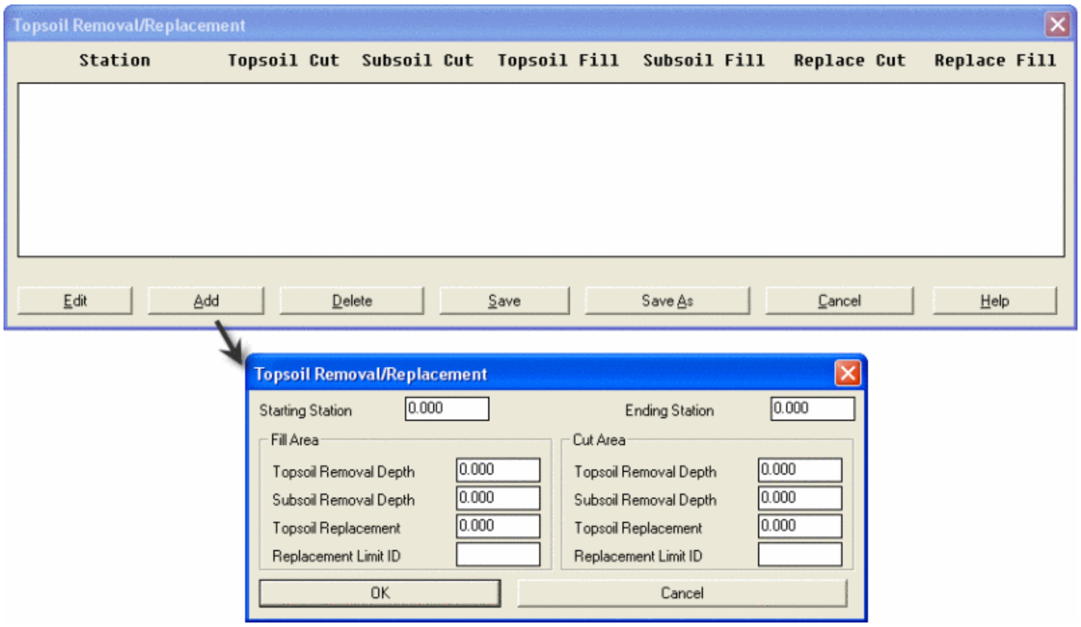
Normal Crown Percent Slope: 2.00
Number of Lanes: 2.0
Lane Width: 12.0
Design Speed (mph): 45.0
Transition Part in Tangent(%) 33.0 Curve(%) 67.0
Speed Table: AASHTO 6% MAX MSE

Begin Transition	Begin Full	End Full	End Transition	Reverse
671.236	884.569	981.214	1194.548	NO

Speed Table: AASHTO 6% MAX MSE
Design Speed 45.00

Input-Edit Super Elevation

Topsoil Removal: Pick this button to select an existing or create a new Topsoil Removal (.TOP) file for the Road. This file allows the user to define topsoil removal and replacement zones to be used in the Road design. Different topsoil depths can be used for different station ranges and then are computed as part of the cut and fill volumes. The **Edit** button opens the **Topsoil File** Editor. This Editor is the same as the one used for the **Topsoil Removal/Replacement** command. Please refer to the **Help** files for that command if additional assistance is needed.


Topsoil Removal/Replacement
Station
Topsoil Cut
Subsoil Cut
Topsoil Fill
Subsoil Fill
Replace Cut
Replace Fill
Edit
Add
Delete
Save
Save As
Cancel
Help
Topsoil Removal/Replacement
OK
Cancel

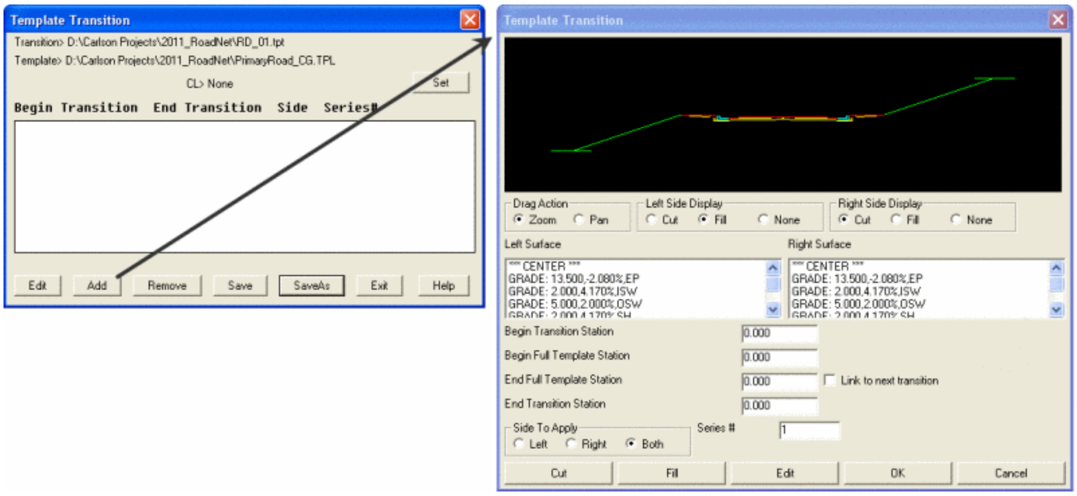
Starting Station 0.000
Ending Station 0.000

Fill Area
Topsoil Removal Depth 0.000
Subsoil Removal Depth 0.000
Topsoil Replacement 0.000
Replacement Limit ID

Cut Area
Topsoil Removal Depth 0.000
Subsoil Removal Depth 0.000
Topsoil Replacement 0.000
Replacement Limit ID

Topsoil Removal/Replacement Editor

Template Transition: Pick this button to select an existing or create a new Template Transition (.TPT) file for the Road. This file allows the user to define changes in grade distances or slopes for a specific Template ID through a range of stations and is another method of widening and narrowing Road sections. The **Edit** button opens the **Template Transition** Editor. This Editor is the same as the one used for the **Template Transition** command. Please refer to the **Help** files for that command if additional assistance is needed.


Template Transition
Set
Edit
Add
Remove
Save
SaveAs
Exit
Help
Template Transition
Drag Action
Left Side Display
Right Side Display
Left Surface
Right Surface
Cut
Fill
Edit
OK
Cancel

Transition> D:\Carlson Projects\2011_RoadNet\RD_01.tpt
Template> D:\Carlson Projects\2011_RoadNet\PrimaryRoad_CG.TPL
CL> None

Begin Transition End Transition Side Series#

Drag Action: ● Zoom ○ Pan
Left Side Display: ○ Cut ● Fill ○ None
Right Side Display: ● Cut ○ Fill ○ None

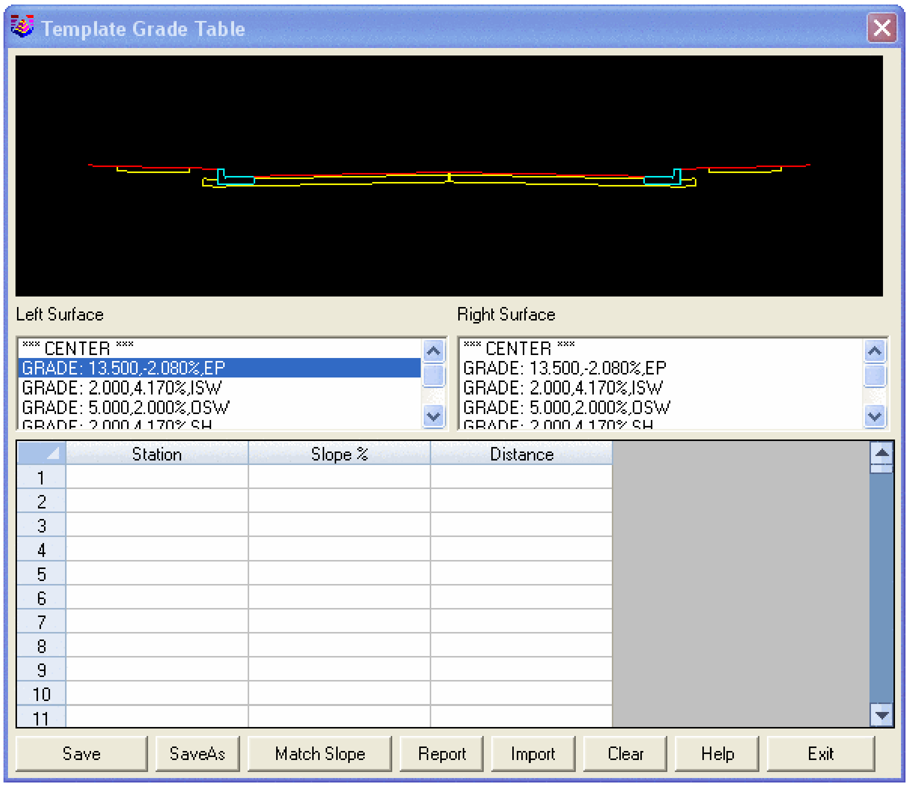
Left Surface:
*** CENTER ***
GRADE: 13.500,-2.080%,EP
GRADE: 2.000,4.170%,ISW
GRADE: 5.000,2.000%,OSW
GRADE: 2.000,4.170% SH

Right Surface:
*** CENTER ***
GRADE: 13.500,-2.080%,EP
GRADE: 2.000,4.170%,ISW
GRADE: 5.000,2.000%,OSW
GRADE: 2.000,4.170% SH

Begin Transition Station 0.000
Begin Full Template Station 0.000
End Full Template Station 0.000 ☐ Link to next transition
End Transition Station 0.000
Side To Apply: ○ Left ○ Right ● Both
Series # 1

Template Transition Editor

Template Grade Table: Pick this button to select an existing or create a new Template Grade Table (.TGT) file for the Road. This file allows the user to define specific slopes and distances for one or more Template IDs (and for left and right sides independently) that have been assigned in the Template (.TPL) file. The **Edit** button opens the **Template Grade Table** Editor. This Editor is the same as the one used for the **Template Grade Table** command. Please refer to the **Help** files for that command if additional assistance is needed.


Template Grade Table
Left Surface
Right Surface
Save
SaveAs
Match Slope
Report
Import
Clear
Help
Exit

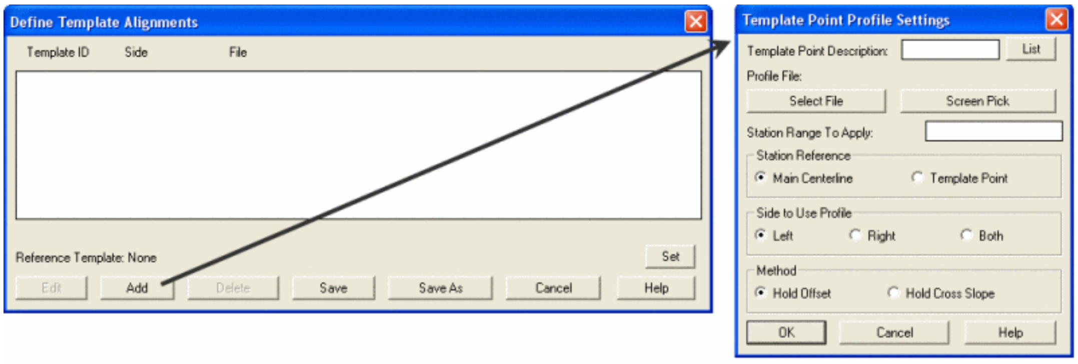
Left Surface:
*** CENTER ***
GRADE: 13.500,-2.080%,EP
GRADE: 2.000,4.170%,ISW
GRADE: 5.000,2.000%,OSW
GRADE: 2.000,4.170% SH

Right Surface:
*** CENTER ***
GRADE: 13.500,-2.080%,EP
GRADE: 2.000,4.170%,ISW
GRADE: 5.000,2.000%,OSW
GRADE: 2.000,4.170% SH

	Station	Slope %	Distance
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

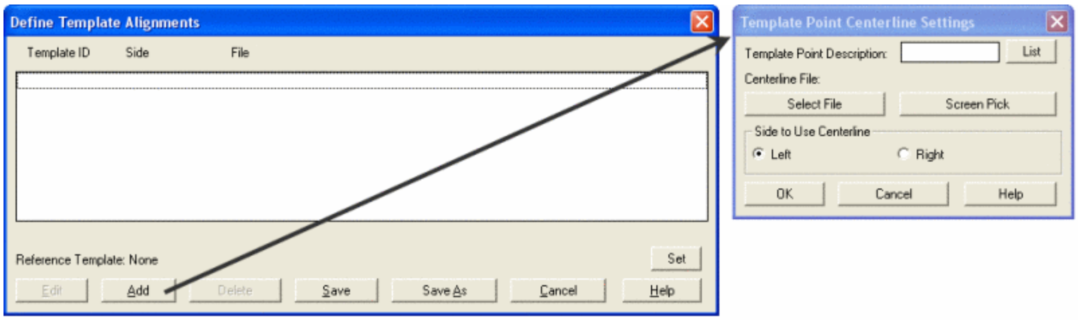
Template Grade Table

Template Pt Profile: Pick this button to select an existing or create a new Template Point Profile (.TPP) file for the Road. This file allows the user to assign separate Profile (.PRO) files to specific Template IDs that have been defined in the Template (.TPL) file. This accommodates varying grade changes (for a ditch, for instance) independent of the Profile for the Centerline. The **Edit** button opens **Define Template Alignments** and then picking the **Add** button displays the **Template Point Profile Settings** dialog box. These dialog boxes are the same as the ones used for the **Assign Template Pt Profile** command. Please refer to the **Help** files for that command if additional assistance is needed.


Define Template Alignments
Template ID
Side
File
Reference Template: None
Set
Edit
Add
Delete
Save
Save As
Cancel
Help
Template Point Profile Settings
Template Point Description:
List
Profile File:
Select File
Screen Pick
Station Range To Apply:
Station Reference
● Main Centerline
○ Template Point
Side to Use Profile
● Left
○ Right
○ Both
Method
● Hold Offset
○ Hold Cross Slope
OK
Cancel
Help

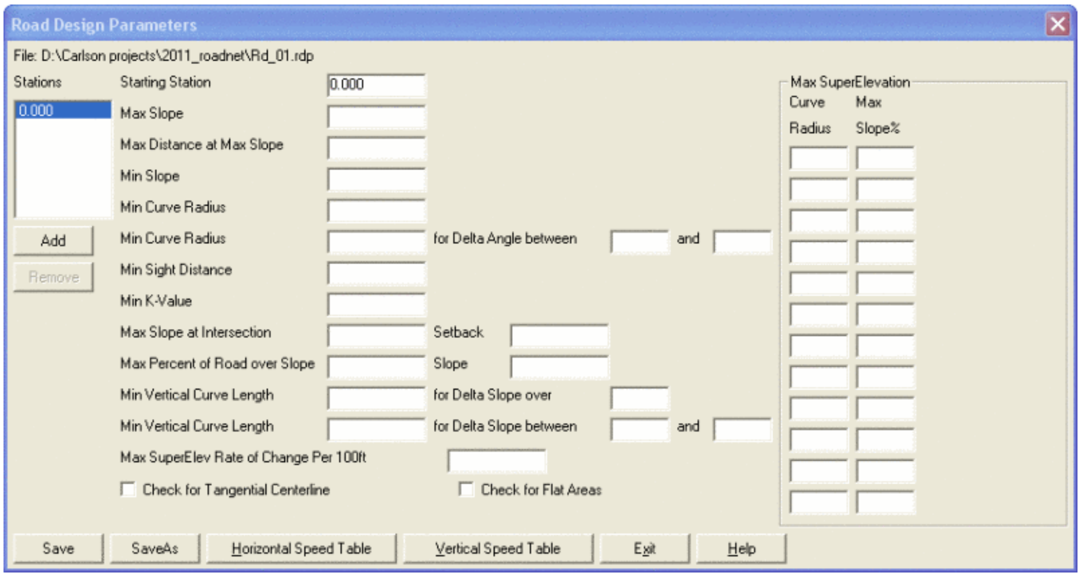
Assign Template Pt Profile Dialog Boxes

Template Pt Centerline: Pick this button to select an existing or create a new Template Point Centerline (.TPC) file for the Road. This file allows the user to assign separate Centerline (.CL) files to specific Template IDs that have been defined in the Template (.TPL) file. This accommodates varying widths for cross-section surfaces and provides an additional method of managing widening and narrowing of Roads. The **Edit** button opens **Define Template Alignments** and then picking the **Add** button displays the **Template Point Centerline Settings** dialog box. These boxes are the same as the ones used for the **Assign Template Pt Centerline** command. Please refer to the **Help** files for that command if additional assistance is needed.


Define Template Alignments
Template ID
Side
File
Reference Template: None
Set
Edit
Add
Delete
Save
Save As
Cancel
Help
Template Point Centerline Settings
Template Point Description:
List
Centerline File:
Select File
Screen Pick
Side to Use Centerline
● Left
○ Right
OK
Cancel
Help

Assign Template Pt Centerline Dialog Boxes

Road Design Parameters: Pick this button to select an existing or create a new Road Design Parameters (.RDP) file for the Road. This file allows the user to define a set of Road design standards to compare against a roadway design. The Road Network Process function will report a warning when the design is out of compliance with these parameters. The Road Design Parameters can be specific to all stations along a Road or, in the event speed limit or other changes must be applied, a range of stations. The **Edit** button opens the **Road Design Parameters** dialog box. This box is the same as the one used for the **Define Road Design Parameters** command. Please refer to the **Help** files for that command if additional assistance is needed.


Road Design Parameters
Stations
Starting Station
Max Slope
Max Distance at Max Slope
Min Slope
Min Curve Radius
Min Curve Radius
for Delta Angle between
and
Min Sight Distance
Min K-Value
Max Slope at Intersection
Setback
Max Percent of Road over Slope
Slope
Min Vertical Curve Length
for Delta Slope over
Min Vertical Curve Length
for Delta Slope between
and
Max SuperElev Rate of Change Per 100ft
☐ Check for Tangential Centerline
☐ Check for Flat Areas
Max SuperElevation
Curve Radius
Max Slope%
Add
Remove
Save
SaveAs
Horizontal Speed Table
Vertical Speed Table
Exit
Help

File: D:\Carlson projects\2011_roadnet\Rd_01.rdp

Stations: 0.000

Starting Station: 0.000

Road Design Parameters Dialog Box

Cut Benches: Pick this button to specify up to 4 triangulation surface files to use when the "Slopes In Series" and "Cut to Surface" options are used in the Template (.TPL) file. In cut conditions, the program will look to intersect with these surfaces before it reaches the final target surface which is the Existing Surface set under Settings.

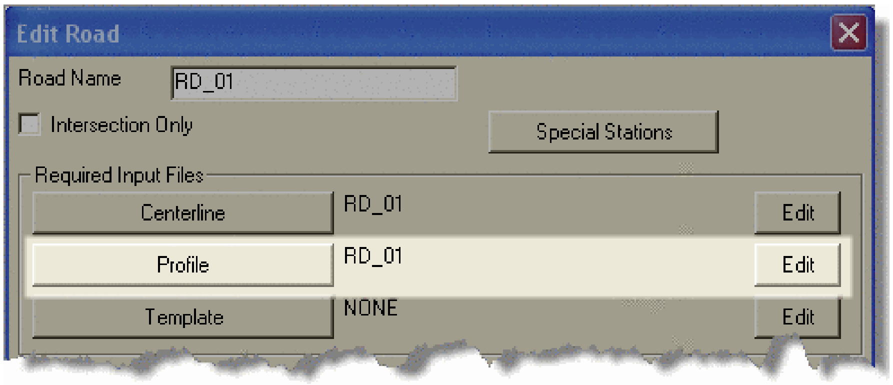
Optional Road Output Files

Existing Section File: Pick this button to specify the path and filename for the existing cross-section file to be written. The default filename is set by picking **Output File Defaults** button in the **Output Options** tab of the **Road Network Settings** dialog box.

Final Section File: Pick this button to specify the path and filename for the final/design cross-section file to be written. The default filename is set by picking **Output File Defaults** button in the **Output Options** tab of the **Road Network Settings** dialog box.

SuperElevation Diagram: Pick this button to specify the path and filename for the SuperElevation Diagram (.SUD) file to be written.

The **Input-Edit Road Profile** Editor is accessible from the **Edit Road** Dialog box.


Edit Road
Intersection Only
Special Stations
Required Input Files
Centerline
Profile
Template
Edit
Edit
Edit

Road Name: RD_01

☐ Intersection Only

Centerline: RD_01

Profile: RD_01

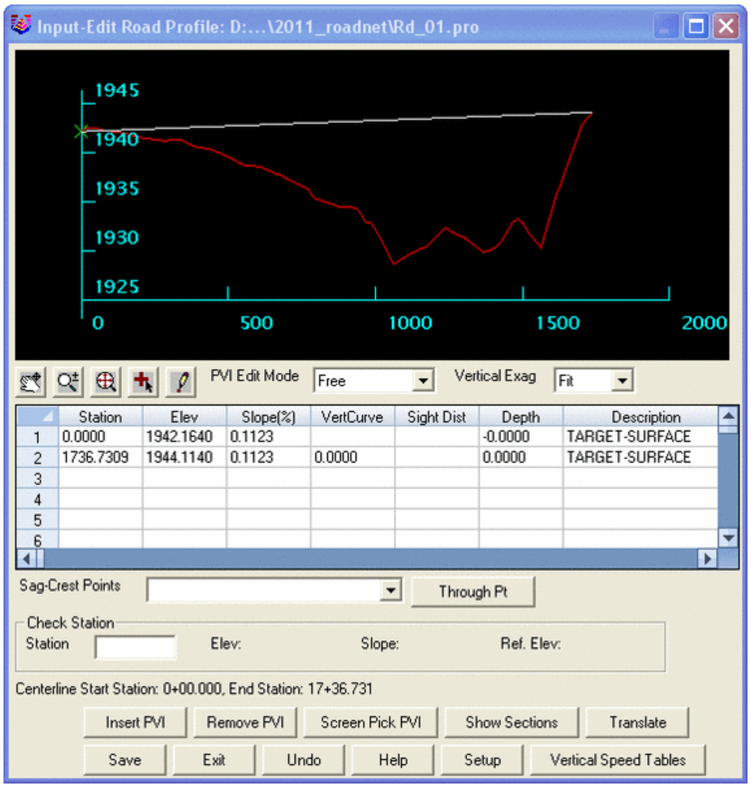
Template: NONE

Pick "Edit" to Access the Input-Edit Road Profile Editor

In Carlson's **Road Network** feature, the initial design Profile is automatically generated and has only a starting and ending PVI - with the elevation at both ends tying into existing ground. The crosshairs are locked to the design Profile.

The initial PVIs can be seen in the profile-grid-view where the existing ground Profile is shown in red and the design Profile in white. The initial PVIs are shown in the table-view with the "PVI Description" indicating the PVI elevation is tied to the "TARGET-SURFACE" (existing ground).

The buttons and settings directly below the profile-grid-view allow the user to edit the Profile and adjust the Zoom and Scale factors of the profile-grid-view. The **Insert PVI**, **Remove PVI** and **Screen Pick PVI** buttons at the bottom of the dialog box allow the user to make changes to the Profile using the table-view.


1945
1940
1935
1930
1925
0
500
1000
1500
2000
Sag-Crest Points
Through Pt
Check Station
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro

PVI Edit Mode: Free

Vertical Exag: Fit

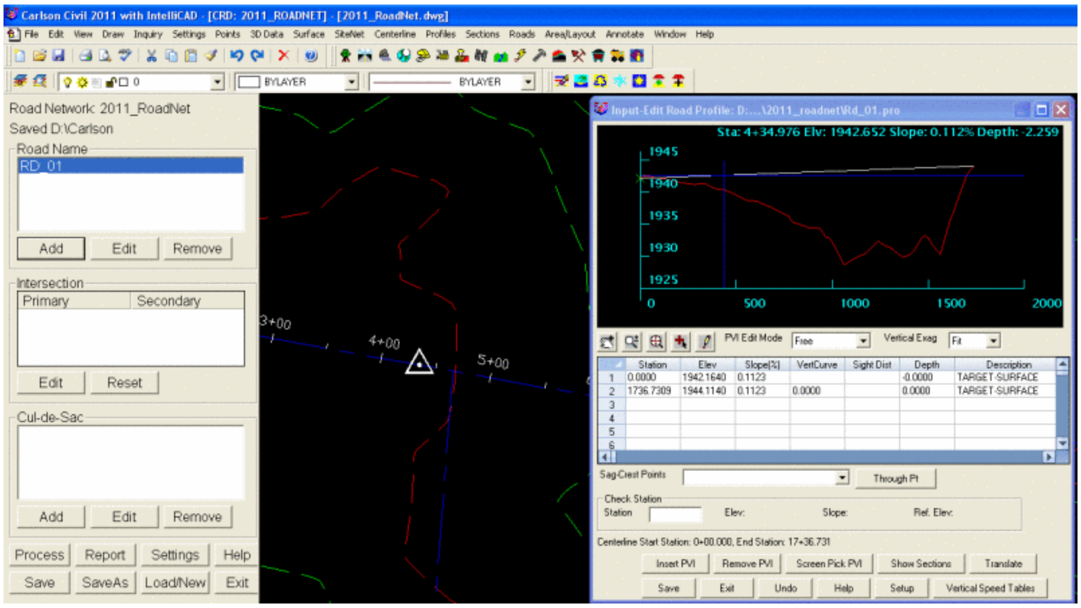
	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	0.1123			-0.0000	TARGET-SURFACE
2	1736.7309	1944.1140	0.1123	0.0000		0.0000	TARGET-SURFACE
3							
4							
5							
6							

Station: Elev: Slope: Ref. Elev:

Centerline Start Station: 0+00.000, End Station: 17+36.731

Input-Edit Road Profile Editor

The profile-grid-view provides the user with a dynamic viewer and editor. As the crosshairs move along the design Profile, a "station" symbol on the drawing screen indicates the corresponding position/station along the Centerline. Also, as the crosshairs move along the Profile, the current Station, Elevation, Slope and Depth (between design and existing ground Profiles) are displayed and dynamically updated at the top of the window. The starting and ending stations for the Centerline are displayed above the buttons at the bottom of the window.


Carlson Civil 2011 with IntelliCAD - [CRD: 2011_ROADNET] - [2011_RoadNet.dwg]

Road Network: 2011_RoadNet

Saved D:\Carlson

Road Name: RD_01

Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro

Sta: 4+34.976 Elv: 1942.652 Slope: 0.112% Depth: -2.259

PVI Edit Mode: Free

Vertical Exag: Fit

	Station	Elev	Slope[%]	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	0.1123			-0.0000	TARGET-SURFACE
2	1736.7309	1944.1140	0.1123	0.0000		0.0000	TARGET-SURFACE
3							
4							
5							
6							

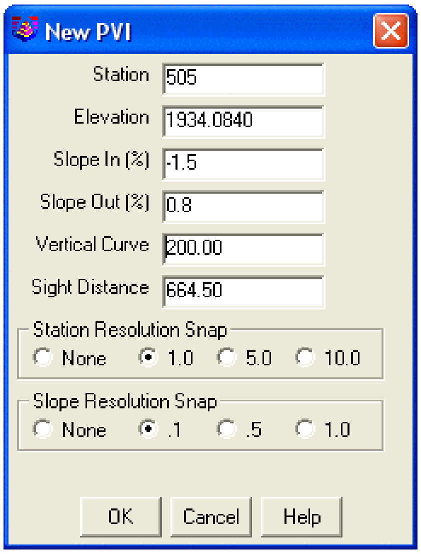
Centerline Start Station: 0+00.000, End Station: 17+36.731

File
Edit
View
Draw
Inquiry
Settings
Points
3D Data
Surface
SiteNet
Centerline
Profiles
Sections
Roads
Area/Layout
Annotate
Window
Help
BYLAYER
BYLAYER
Add
Edit
Remove
Intersection
Primary
Secondary
Edit
Reset
Cul-de-Sac
Add
Edit
Remove
Process
Report
Settings
Help
Save
SaveAs
Load/New
Exit
3+00
4+00
5+00
1945
1940
1935
1930
1925
0
500
1000
1500
2000
Sag-Crest Points
Through Pt
Check Station
Station
Elev:
Slope:
Ref. Elev:
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Input-Edit Road Profile Editor with Station Indicator in Drawing

Pan, **Zoom** and **Zoom Extents**: Use these buttons to change the Zoom factor in the profile-grid-view.

Add PVI: Use this button to "screen pick" the location for a new PVI in the profile-grid-view. After screen picking the new PVI location, the **New PVI** box prompts the user to provide additional design criteria to set the new PVI.


New PVI

Station: 505

Elevation: 1934.0840

Slope In (%): -1.5

Slope Out (%): 0.8

Vertical Curve: 200.00

Sight Distance: 664.50

Station Resolution Snap: ○ None ● 1.0 ○ 5.0 ○ 10.0

Slope Resolution Snap: ○ None ● .1 ○ .5 ○ 1.0

OK
Cancel
Help

New PVI Dialog Box

PVI Edit Mode: Free

Edit PVI and **PVI Edit Mode**: Use the **Edit PVI** button to change the elevation and station of a PVI in the profile-grid-view by dragging-and-dropping it to a new location. The default **PVI Edit Mode** is "Free" which allows 360-degree motion when dragging-and-dropping the PVI. Other **PVI Edit Mode** options are: ***Hold Slope In***, ***Hold Slope Out***, ***Hold Station and Hold Elevation***. The user also can choose to ***Hold Vertical Curve Length***, ***Hold K-Value*** or ***Hold Sight Distance*** when editing the PVI using drag-and-drop. This setting is controlled in the **Road Profile Settings** dialog box.

Vertical Exag: Use this setting to "Fit" the Profile into the profile-grid-view area of the window or use other pre-defined options such as "x1", "x2", "x5" and "x10" to exaggerate the vertical scale by 1-, 2-, 5- or 10-times.

Sag-Crest Points: After adding one or more vertical curves to the design Profile, a list of the "sag" and "crest" points along the Profile will be listed in the drop-down box.

Through Point: After selecting a PVI in the table-view, pick this button to force a sag or crest point to a specific station and elevation.

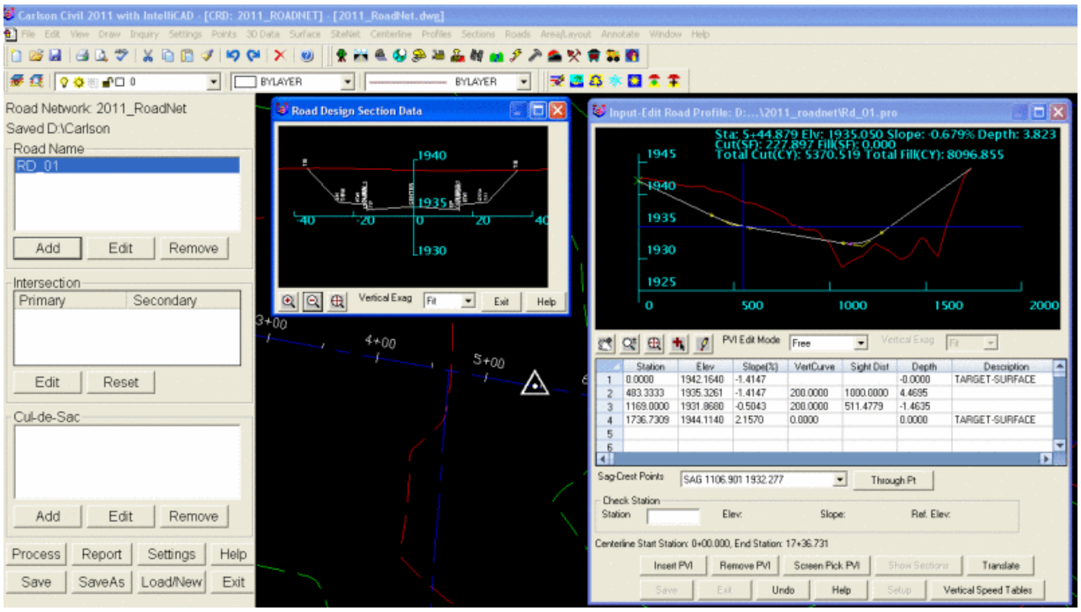
Check Station: To find the precise Elevation, Slope and Reference Elevation (existing ground) for a specific station, enter the station in the text box and *press Enter*.

Insert PVI: Before picking the **Insert PVI** button, the user must use the mouse to select/highlight a cell in the profile table-view. Then, picking the **Insert PVI** button will create a blank row, ***above the selected row***, allowing the user to enter the information for the new PVI.

Remove PVI: Before picking the **Remove PVI** button, the user must use the mouse to select/highlight a cell in the row corresponding to the PVI to be removed. Then, picking the **Remove PVI** button will delete the selected row/PVI from the Profile.

Screen Pick PVI: Picking this button allows the user to change the station of a PVI by screen picking a location in the drawing. Before picking the **Screen Pick PVI** button, the user must use the mouse to select/highlight a cell in the corresponding row of the PVI to be changed. Then, picking the **Screen Pick PVI** button changes the user to the active drawing screen, prompting the user to "Pick PVI Point:" in the drawing area.

Show Sections: This option is only available if the Template (.TPL) file for the Road has already been specified in the **Edit Roads** dialog box. When picked, the **Show Sections** button will open a "Road Design Section Data" viewer window while keeping the "Road Profile" window open as well. This provides the user a dynamic design environment in which the plan-, profile- and section-views are visible at one time. Additionally, when the "Section" viewer window is open, the notes at the top of the profile-grid-view include the "Cut" and "Fill" end-area at the current station along with the "Cut" and "Fill" volume for the entire Road. These calculations are dynamic and will update if changes are made to the design Profile. Use the Specific Station to check the section at a station. Or move the cursor in the profile preview graphic to change the section station.



Carlson Civil 2011 with IntelliCAD - [CRD: 2011_ROADNET] - [2011_RoadNet.dwg]

Road Network: 2011_RoadNet

Saved D:\Carlson

Road Name: RD_01

Road Design Section Data

Vertical Exag: Fit

Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro

Sta: 5+44.879 Elv: 1935.050 Slope: -0.679% Depth: 3.823
Cut(SF): 227.897 Fill(SF): 0.000
Total Cut(CY): 5370.519 Total Fill(CY): 8096.855

PVI Edit Mode: Free

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	-1.4147			-0.0000	TARGET-SURFACE
2	483.3333	1935.3261	-1.4147	200.0000	1000.0000	4.4695	
3	1169.0000	1931.8680	-0.5043	200.0000	511.4779	-1.4635	
4	1736.7309	1944.1140	2.1570	0.0000		0.0000	TARGET-SURFACE
5							
6							

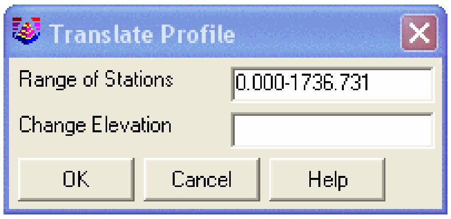
Sag-Crest Points: SAG 1106.901 1932.277

Centerline Start Station: 0+00.000, End Station: 17+36.731

File
Edit
View
Draw
Inquiry
Settings
Points
3D Data
Surface
SiteNet
Centerline
Profiles
Sections
Roads
Area/Layout
Annotate
Window
Help
0
BYLAYER
BYLAYER
Add
Edit
Remove
Intersection
Primary
Secondary
Edit
Reset
Cul-de-Sac
Add
Edit
Remove
Process
Report
Settings
Help
Save
SaveAs
Load/New
Exit
1940
1935
1930
-40
-20
0
20
40
Exit
Help
3+00
4+00
5+00
1945
1940
1935
1930
1925
0
500
1000
1500
2000
Vertical Exag
Fit
Through Pt
Check Station
Station
Elev:
Slope:
Ref. Elev:
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Road Profile View and Section Viewer with Station Indicator in Drawing

Translate: Picking this button will display the **Translate Profile** dialog box and allows the user to change the elevation of the entire Profile or a range of stations along the Profile.

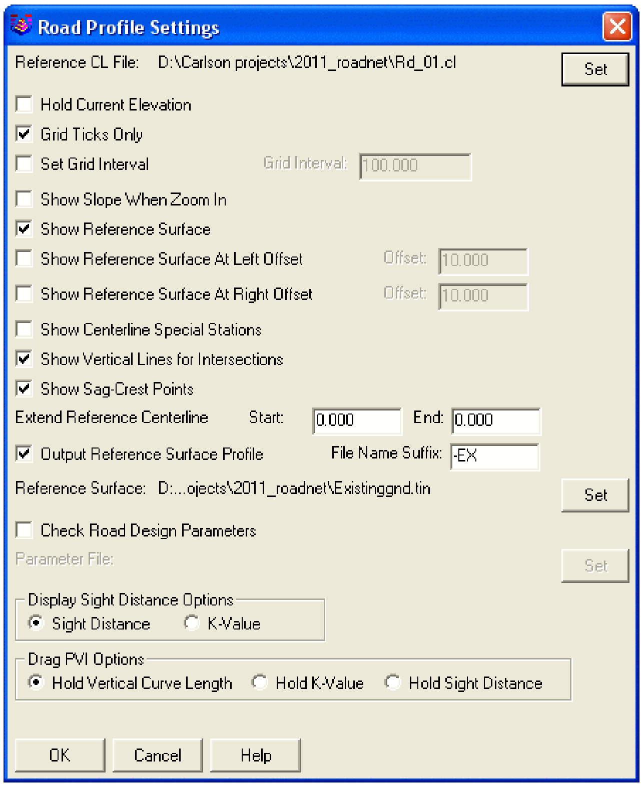


Range of Stations: 0.000-1736.731

Change Elevation:

Translate Profile dialog box

Save: This button saves changes to the Profile (.PRO) file.
Exit: This button exits the **Input-Edit Road Profile** editor dialog box.
Undo: This button will undo the last change made to the Profile.
Setup: This button opens the **Road Profile Settings** dialog box. See below for more information.
Vertical Speed Tables: Use this button to specify the Vertical Curve Speed Table (.VST) files to use for the design of this Road.



Reference CL File: D:\Carlson projects\2011_roadnet\Rd_01.cl

☐ Hold Current Elevation
☑ Grid Ticks Only
☐ Set Grid Interval Grid Interval: 100.000
☐ Show Slope When Zoom In
☑ Show Reference Surface
☐ Show Reference Surface At Left Offset Offset: 10.000
☐ Show Reference Surface At Right Offset Offset: 10.000
☐ Show Centerline Special Stations
☑ Show Vertical Lines for Intersections
☑ Show Sag-Crest Points
Extend Reference Centerline Start: 0.000 End: 0.000
☑ Output Reference Surface Profile File Name Suffix: -EX
Reference Surface: D:...ojects\2011_roadnet\Existinggnd.tin
☐ Check Road Design Parameters
Parameter File:

Display Sight Distance Options
● Sight Distance ○ K-Value

Drag PVI Options
● Hold Vertical Curve Length ○ Hold K-Value ○ Hold Sight Distance

Road Profile Settings Dialog Box

Reference CL File: In the **Road Network** feature, the "Reference CL File" is automatically set to the Centerline (.CL) file associated with the Road.
Hold Current Elevation: When enabled and the station and elevation of a PVI changes, the "Slope Out" of the adjusted PVI will change but the elevation of the next PVI will be left unchanged. Otherwise, if not enabled, the "Slope Out" of the adjusted PVI is held and the elevation of the next PVI is changed.
Grid Ticks Only: When enabled, only grid ticks will be shown in the profile-grid-view. Otherwise grid lines will be used.
Set Grid Interval: If enabled, this option allows the user to manually specify the grid- or grid-tick interval shown in the profile-grid-view.
Show Slope When Zoom In: When enabled, this option allows the user to display the slopes on those vertical tangents that are long enough to display a slope label when Zoom-ing in closer to the Profile.
Show Reference Surface: When enabled, this option displays the Profile of a "Reference Surface" in addition to the

design Profile. The "Reference Surface" is typically the original or existing ground Profile.

Show Reference Surface at Left Offset: When enabled, this option allows the user to see an additional Profile that is offset horizontally from the "Reference Centerline". The offset distance can be specified after the option is enabled.

Show Reference Surface at Right Offset: When enabled, this option allows the user to see an additional Profile that is offset horizontally from the "Reference Centerline". The offset distance can be specified after the option is enabled.

Show Centerline Special Stations: When enabled, critical Centerline stations such as PC, PT, SC, ST, TS and SP are shown in the profile-grid-view.

Show Vertical Lines for Intersections: When enabled, this option will display a vertical line representing the Centerline and Edge of Pavement stations for other Roads in the Road Network.

Show Sag-Crest Points: When enabled, this option displays a marker at the sag and crest points of each vertical curve.

Extend Reference Centerline: When enabled, the user may provide an extended range of stations so as to show Profile data beyond that generated along the associated Centerline (.CL) file. For instance, for a new Road tying into an existing Road (proposed CL file starts at the Intersection of the Centerline of the existing Road) an extended range of stations may be desired in order to see the Profile of the cross-slope, curb, ditch and slope across both sides the existing Road.

Output Reference Surface Profile and **Suffix**: When enabled, this option will generate an existing ground Profile (.PRO) file and allows the user to specify a suffix for the filename. The defaults for this option are set using the **Output File Defaults** button in the **Output Options** tab of the **Road Network Settings** dialog box.

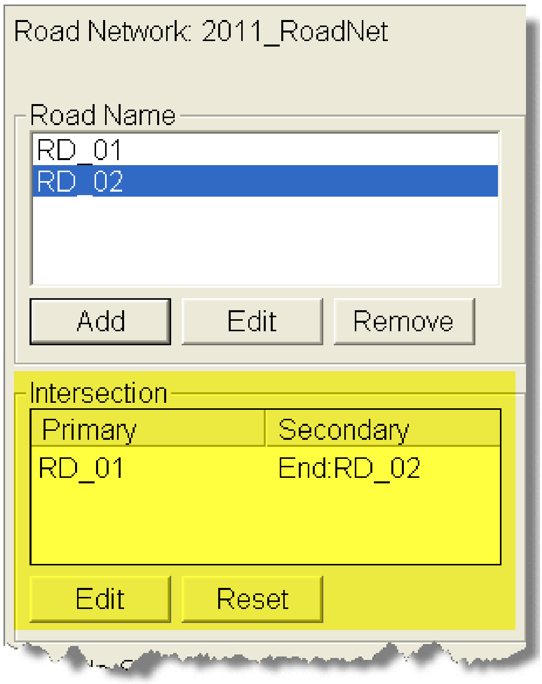
Reference Surface: The "Reference Surface" is an additional surface Profile shown in the profile-grid-view alongside the design Profile. For the **Road Network** feature, the "Reference Surface" is the surface specified as "Existing Ground" in **Road Network Settings** dialog box.

Check Road Design Parameters: When enabled, this option will compare the current Road design to an established set of design parameters set in a Road Design Parameters (.RDP) file. Please refer to the **Help** files for the **Road Design Parameters** command if additional assistance is needed.

Display Sight Distance Options: Use this radio button to display either a "Sight Distance" or "K-Value" column in the profile-table-view.

Drag PVI Options: Use this radio button to specify the design criteria to "hold" when using the **Edit/Drag PVI** command in the profile-grid-view. The options are to "Hold Vertical Curve Length", "Hold K-Value" or "Hold Sight Distance".

Intersections are created automatically in the **Road Network** feature without any input from the user. Once Intersections are identified, they are listed and managed in the **Intersection** area of the **Road Network: Task Pane**.



Intersection Area of the Road Network Task Pane

Edit: Use this button to display the **Edit Intersection** dialog box and make changes to the **Input Data** and **Output Files** for the selected Intersection. Other changes that can be made to the Intersection design are:

1) Changing the Primary/Secondary status of the Roads creating the Intersection,
2) Making design changes that apply to the entire Intersection,
3) Making design changes that apply to one or more Corners of the Intersection.

Reset: Use this button to overwrite all design changes made to the selected Intersection and reset to the original Intersection design.

As stated above, Intersections are created automatically in the **Road Network** feature without any input from the user. Road Network recognizes and calculates the Intersection using the Centerline (.CL) files associated with the Roads in the Network. If two Roads are added to the Network and they share one or more common point, an Intersection is created and displayed as an Intersection in the **Road Network: Task Pane**.

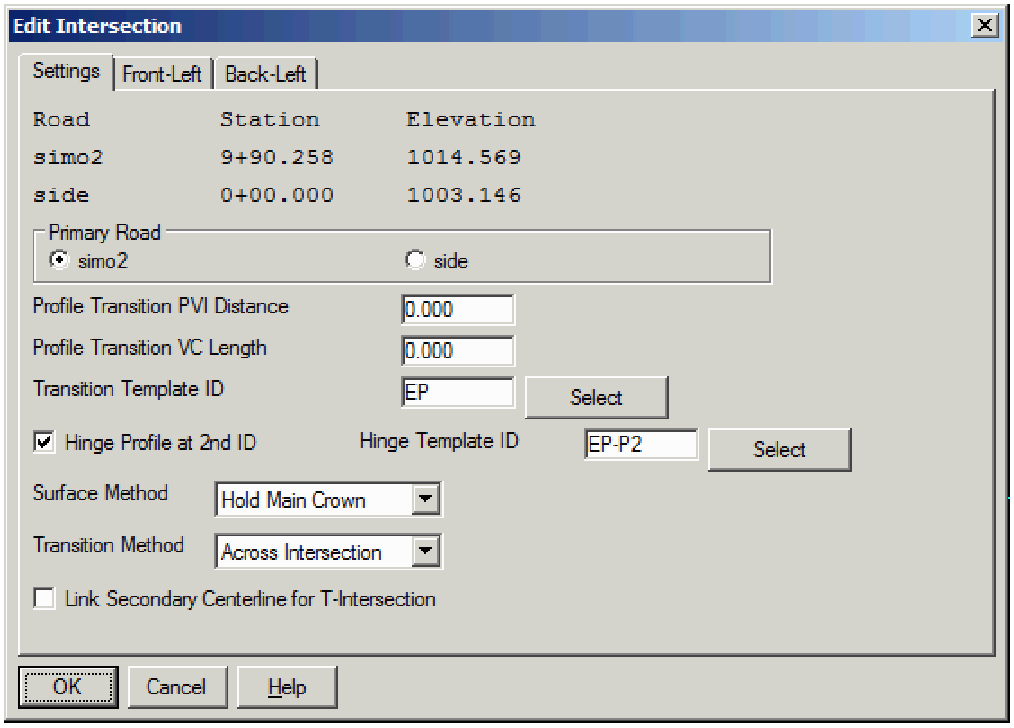
For all Intersections, one of the two Roads creating the Intersection will be the "Primary" Road and the other will be the "Secondary" Road. When setting grade through an Intersection, the Primary Road's Template (.TPL) file takes priority and is used to define the cross-section. The grades of the Secondary Road will adjust to match the Primary Road. Additionally, changes to any of the Primary Road design files - such as the Profile (.PRO) file - will automatically update the affected file(s) of the Secondary Road.

Upon creation of an Intersection, the **Road Network** feature automatically designates one of the Roads as the Primary Road and the other as Secondary. For four-way Intersections, the first Road added to the Road Network will be deemed the Primary Road and the second Road will be Secondary. For T-Intersections, the Road going straight-through the Intersection will be deemed the Primary Road - even if it's added to the Network after the Road that stops at the Intersection. The user can change the Primary Road designation in the **Edit Intersection** dialog box.

Picking the **Edit** button displays the **Edit Intersection** dialog box which has a **Settings** tab and, depending on the type of Intersection, 2 or 4 additional tabs - each representing one **Corner** of the Intersection. The **Corner** tabs are labeled ***Front-Right***, ***Back-Right***, ***Front-Left*** or ***Back Left***. T-Intersections will have 2 tabs and 4-way Intersections will have 4 tabs.

Intersection Settings

At the top of the **Settings** tab, the station and elevation of the Intersection is shown for all Roads.



Edit Intersection

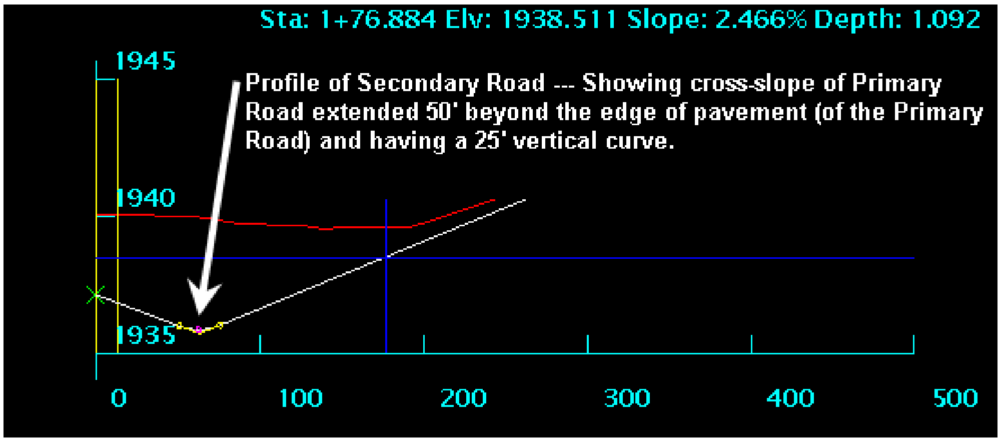
Road	Station	Elevation
simo2	9+90.258	1014.569
side	0+00.000	1003.146

Primary Road
● simo2 ○ side

Profile Transition PVI Distance: 0.000
Profile Transition VC Length: 0.000
Transition Template ID: EP
☑ Hinge Profile at 2nd ID
Hinge Template ID: EP-P2
Surface Method: Hold Main Crown
Transition Method: Across Intersection
☐ Link Secondary Centerline for T-Intersection

The Settings Tab of the Edit Intersection Dialog Box

Primary Road: Use the radio button to specify the Primary Road of the Intersection.
Profile Transition PVI Distance: This value represents the distance beyond the edge of pavement of the Primary Road (along the Secondary Road Centerline) that the cross-slope of the Primary Road will be extended.
Profile Transition VC Length: This setting allows the user to specify the length of vertical curve to be inserted at the PVI where the extension of the Primary Road's cross-slope and the Centerline of the Secondary Road meet.



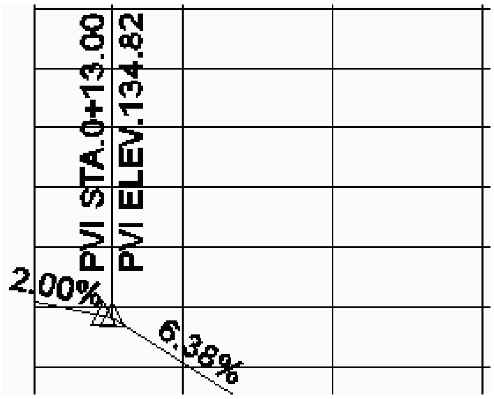
Sta: 1+76.884 Elv: 1938.511 Slope: 2.466% Depth: 1.092

Profile of Secondary Road --- Showing cross-slope of Primary Road extended 50' beyond the edge of pavement (of the Primary Road) and having a 25' vertical curve.

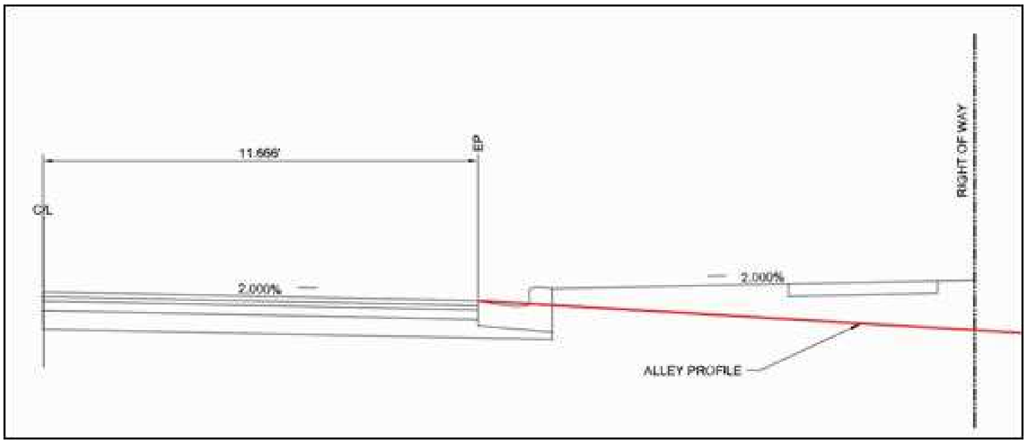
"Profile Transition PVI Distance" and "Profile Transition VC Length"

Template ID: This is the point on the cross-section used to define the horizontal (Centerline) and vertical (Profile) alignments around the Corners of the Intersection. Also, the profile for the side road will tie into this Template ID on the main road. The Template ID may be specified as any point on the cross-section - such as edge of pavement (EP) or the back of curb (BC) - as long as it has been defined as a **Template ID** in all of the Template (.TPL) files used to calculate the Intersection. Type the **Template ID** in the text box or use the **Select** button to choose from a list.

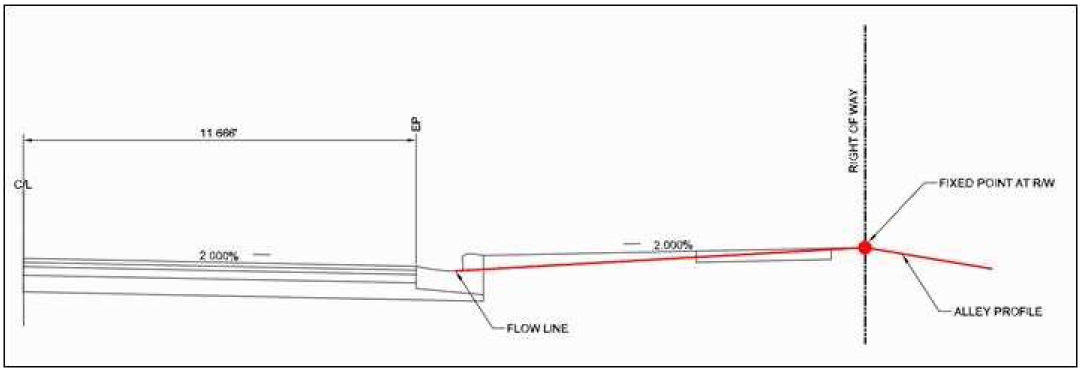
Additional Transition Distance: This option adjusts the transition PVI station on the side profile. The transition station starts as the offset of the Template ID on the main road. The cross slope of the main road is used up to the transition station. For example, if the Template ID is for edge of pavement up to the gutter pan at 11.67 and the side profile needs to match the main crown up the the flow line at 13.00, then the Additional Transition Distance should be set to 1.33.



Hinge Profile and 2nd ID: For the side road profile, this is an optional second point to match from the main road template.



Cross-section of main road showing side (alley) profile tieing into single Template ID at flow line


11.666'
EP
C/L
RIGHT OF WAY
FIXED POINT AT R/W
2.000%
2.000%
FLOW LINE
ALLEY PROFILE

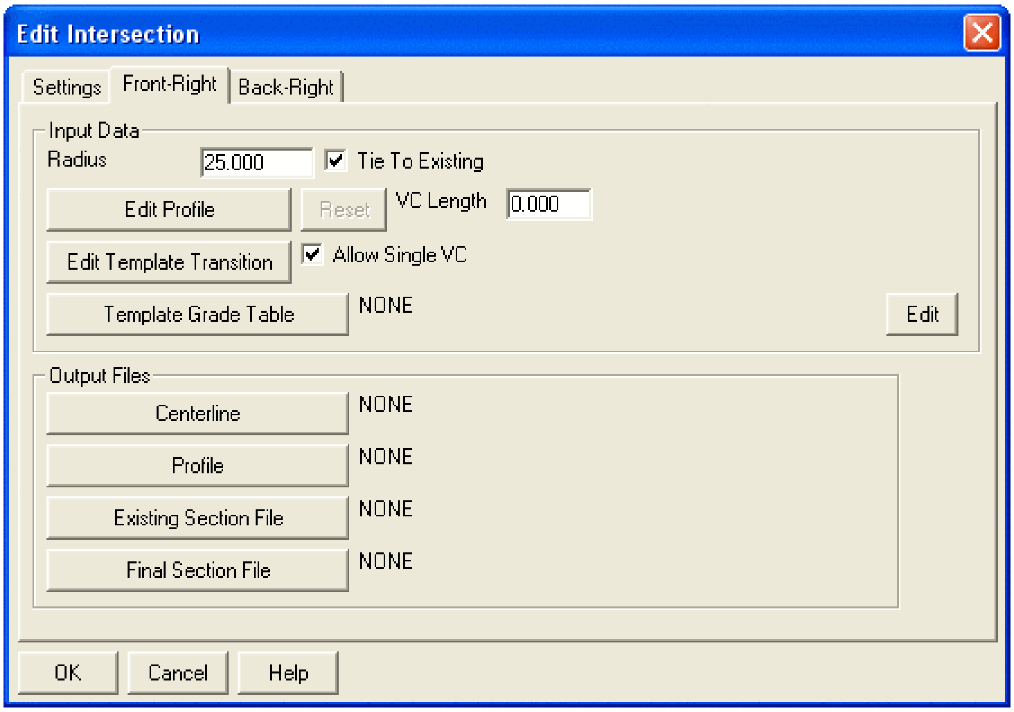
Cross-section of main road showing side (alley) profile tieing into Template ID at flow line as well as 2nd Hinge at Right-of-way of main road

Surface Method: See the Transition Defaults section above for details on this setting.
Transition Method: See the Transition Defaults section above for details on this setting.
Link Secondary Centerline for T-Intersection: When this option is enabled, changes to the Centerline (.CL) file of the Primary Road will, if necessary, force the Centerline of the Secondary Road to be extended or trimmed in order to keep the Intersection intact.

Note: The default value for several design criteria such as Intersection radius and length of vertical curve can be set in the **Transition Defaults** tab of the **Road Network: Settings** dialog box.

Corner tabs - *Front-Right*, *Back-Right*, *Front-Left*, *Back-Left*

Depending on the type of Intersection ("T" or 4-way), there will be either 2 or 4 additional tabs available in this dialog box. Each of these tabs represent a Corner of the Intersection and allows the user to specify horizontal and vertical **Input Data** and **Output Files** specifically for that Corner.


Edit Intersection
Settings
Front-Right
Back-Right
Input Data
Edit Profile
Reset
Edit Template Transition
Template Grade Table
Edit
Output Files
Centerline
Profile
Existing Section File
Final Section File
OK
Cancel
Help

Radius 25.000
☑ Tie To Existing
VC Length 0.000
☑ Allow Single VC
Template Grade Table NONE
Centerline NONE
Profile NONE
Existing Section File NONE
Final Section File NONE

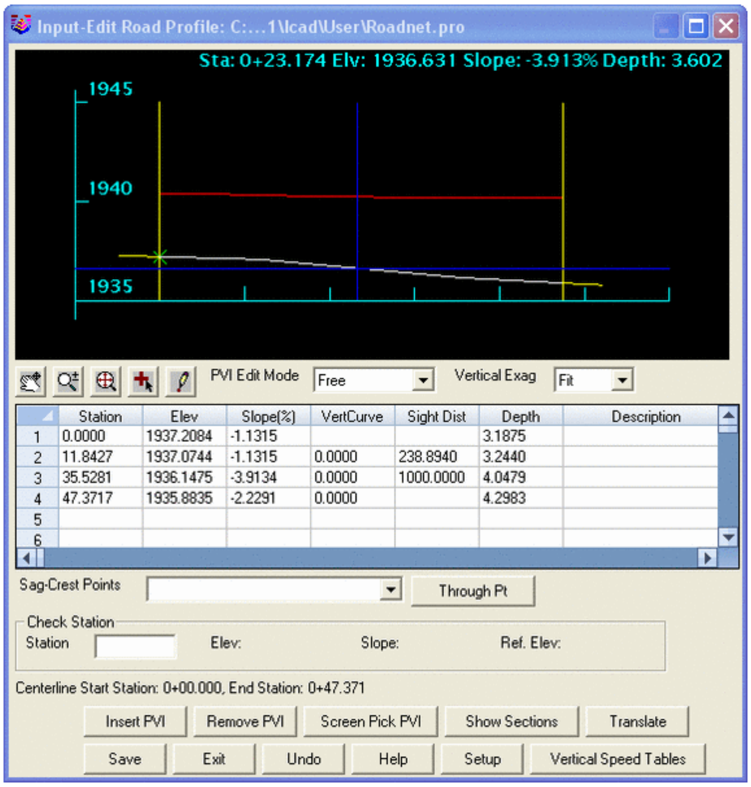
One of the "Corner" Tabs of the Edit Intersection Dialog Box

Intersection Input Data

Radius: Use this value to specify the radius of the curve for this Corner of the Intersection. The **Intersection Template ID** specified in the **Intersection Settings** tab of this dialog box determines the point on the cross-section being affected by this setting.

Tie to Existing: Enable this option to keep cut and fill slopes from projecting to the existing ground through the Intersection. In areas of steep cut or fill, this setting helps avoid overlapping Road and Intersection tie slopes.

Edit Profile: Pick this button to open the **Input-Edit Road Profile** Editor and make changes to the Profile for this Corner of the Intersection. The **Intersection Template ID** specified in the **Intersection Settings** tab of this dialog box determines the point on the cross-section being represented in the Profile Editor. See **Road Network: Road Profile Editor** for more **Help** with this feature.



Input-Edit Road Profile: C:...1\lcad\User\Roadnet.pro

Sta: 0+23.174 Elv: 1936.631 Slope: -3.913% Depth: 3.602

PVI Edit Mode: Free

Vertical Exag: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1937.2084	-1.1315			3.1875	
2	11.8427	1937.0744	-1.1315	0.0000	238.8940	3.2440	
3	35.5281	1936.1475	-3.9134	0.0000	1000.0000	4.0479	
4	47.3717	1935.8835	-2.2291	0.0000		4.2983	
5							
6							

Sag-Crest Points

Check Station

Station

Elev:

Slope:

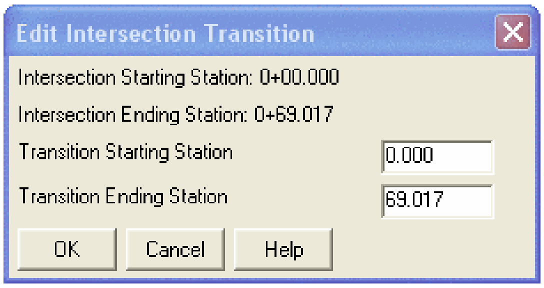
Ref. Elev:

Centerline Start Station: 0+00.000, End Station: 0+47.371

Edit Profile for a Corner of an Intersection

Reset: Use this button to overwrite all edits to the Profile of the Corner of the Intersection and reset to the original Profile.

Edit Template Transition: Pick this button to display the **Edit Intersection Transition** dialog box. This allows the user to control the stations for transitioning through the Intersection from a Template on one Road to a different Template on another Road. These Transition stations only apply when the Roads in an Intersection have been assigned different Template (.TPL) files.



Edit Intersection Transition

Intersection Starting Station: 0+00.000

Intersection Ending Station: 0+69.017

Transition Starting Station: 0.000

Transition Ending Station: 69.017

Edit Intersection Transition Dialog Box

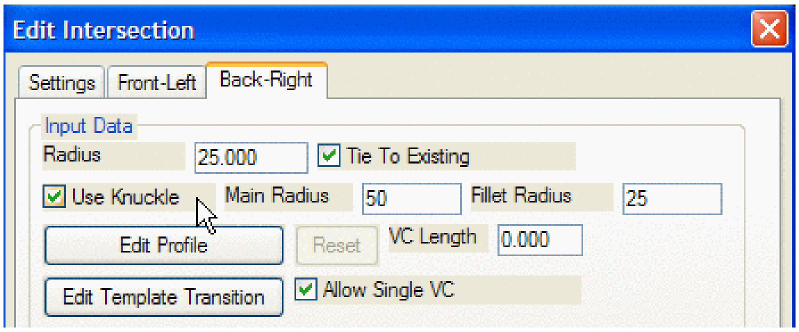
In the Intersection Transition Dialog Box... The Starting and Ending Stations of the Intersection transition are displayed at the top of the dialog box.

Transition Starting Station: This is the station at which the Primary Road Template ends.
Transition Ending Station: This is the station at which the Secondary Road starts.

Corner tabs (Continued)

Allow Single VC: When the difference in grade at the Intersection between the Primary Road and the Secondary Road is too severe, two intermediate PVIs must be inserted into the Profile of the Corner of the Intersection in order to properly transition from one Road to another. In some cases, the transition is possible using only one intermediate PVI in the Corner Profile. If this option is enabled and if the intersecting grades allow it, only one intermediate PVI will be inserted. If this option is not enabled, two intermediate PVIs will be inserted regardless of the intersecting grades.
Template Grade Table: Pick this button to select an existing or create a new Template Grade Table (.TGT) file defining the grades for the Corner of the Intersection. This file allows the user to define specific slopes and distances for one or more **Template IDs** that have been assigned in the Template (.TPL) file. The **Edit** button opens the **Template Grade Table** Editor. This Editor is the same as the one used for the **Template Grade Table** command. Please refer to the **Help** files for that command if additional assistance is needed.

"L" Intersection with Knuckle: When two centerlines connect at a right angle for an "L" intersection, there is a **Use Knuckle** option for the outside corner that can be used to make a knuckle bulb.



Edit Intersection

Radius 25.000

☑ Tie To Existing

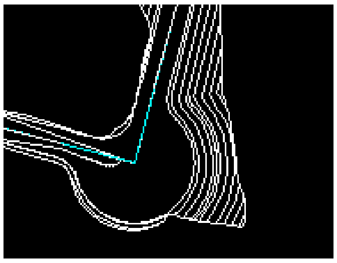
☑ Use Knuckle

Main Radius 50

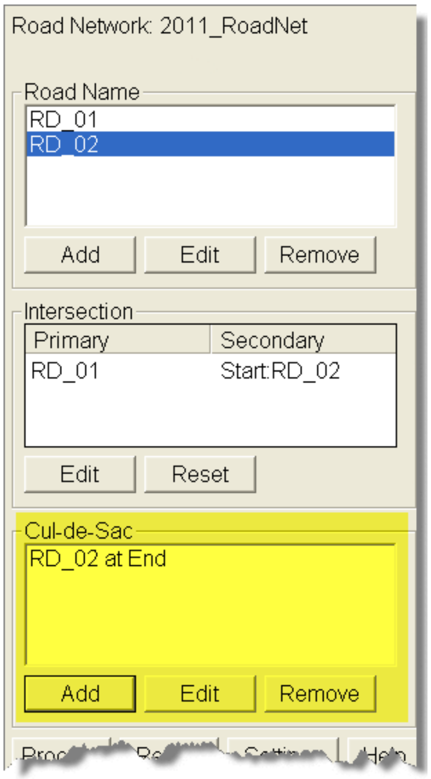
Fillet Radius 25

VC Length 0.000

☑ Allow Single VC

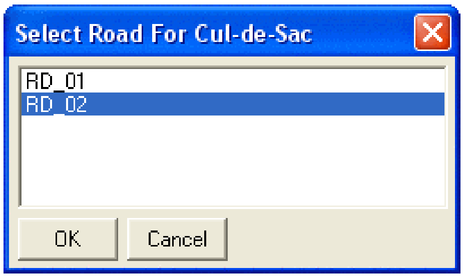


Centerline: Pick this button to output a Centerline (.CL) file representing the horizontal alignment around this Corner of the Intersection. The **Intersection Template ID** specified in the **Intersection Settings** tab determines the point on the cross-section exported to the Centerline (.CL) file.
Profile: Pick this button to output a Profile (.PRO) file representing the vertical alignment around this Corner of the Intersection. The **Intersection Template ID** specified in the **Intersection Settings** tab determines the point on the cross-section exported to the Profile (.PRO) file.
Existing Section File: Pick this button to output an Existing Section (.SCT) file for this Corner of the Intersection.
Final Section File: Pick this button to output a Final Section (.SCT) file for this Corner of the Intersection.
Cul-de-Sacs may be added to any Road in the Network and are managed in the **Cul-de-Sac** area of the **Road Network: Task Pane**.



Cul-de-Sac Area of the Road Network Task Pane

Add: Picking this button will display a list of Roads in the Network and prompt the user to **"Select Road for Cul-de-Sac"...**. After selecting the Road, the **Edit Cul-de-Sac** dialog box is displayed allowing the user to specify the **Input Data** and **Output Files** for the Cul-de-Sac.
Edit: Use this button to display the **Edit Cul-de-Sac** dialog box and make changes to the **Input Data** and **Output Files** for the selected Cul-de-Sac.
Remove: Use this button to **Remove** the selected Cul-de-Sac from the Road.
Add: Picking this button displays a dialog box listing the Roads in the Network and prompting the user to **Select Road for Cul-de-Sac**.

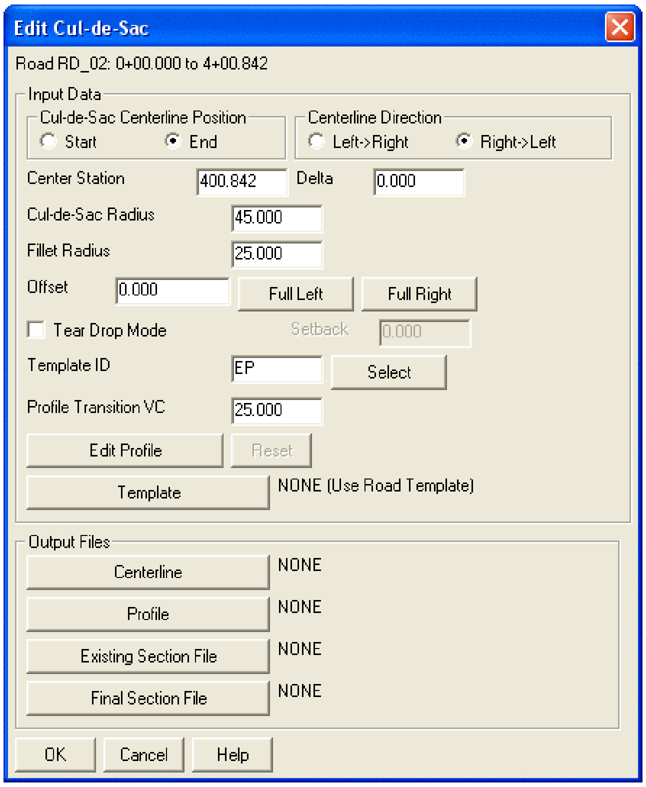


Select Road For Cul-de-Sac

RD_01
RD_02

Select Road for Cul-de-Sac

After choosing the Road and picking the **OK** button, the **Edit Cul-de-Sac** dialog box is displayed.



Edit Cul-de-Sac

Road RD_02: 0+00.000 to 4+00.842

Input Data

Cul-de-Sac Centerline Position: ○ Start ● End

Centerline Direction: ○ Left->Right ● Right->Left

Center Station: 400.842

Delta: 0.000

Cul-de-Sac Radius: 45.000

Fillet Radius: 25.000

Offset: 0.000

☐ Tear Drop Mode

Setback: 0.000

Template ID: EP

Profile Transition VC: 25.000

Template: NONE (Use Road Template)

Output Files

Centerline: NONE

Profile: NONE

Existing Section File: NONE

Final Section File: NONE

Edit Cul-de-Sac Dialog Box

Cul de Sac Input Data

Cul-de-Sac Centerline Position: Use this radio button to specify whether the Cul-de-Sac is drawn at the starting or the ending station of the Centerline.

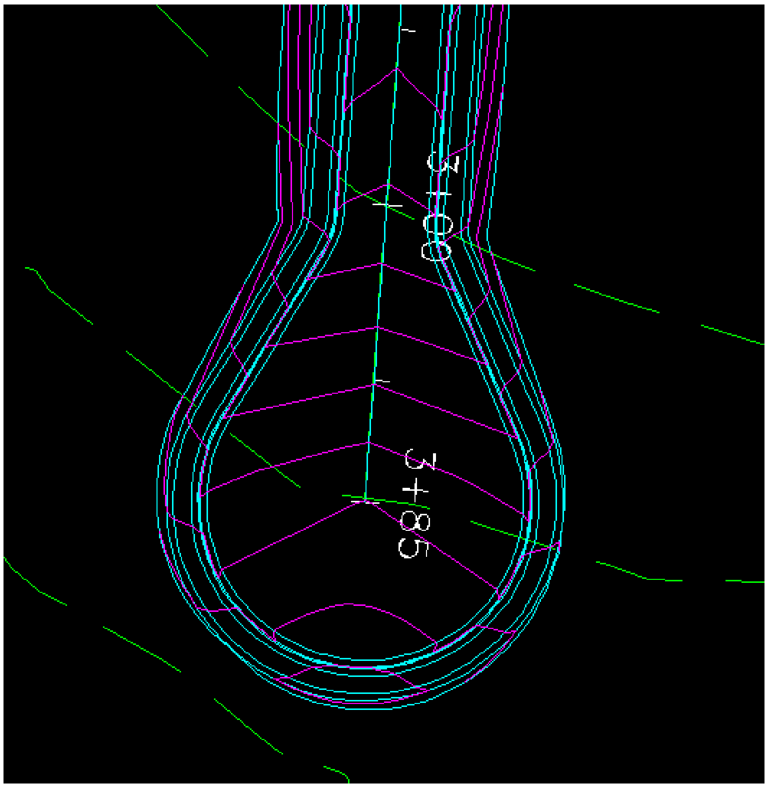
Centerline Direction: This setting applies only if the horizontal alignment of the Cul-de-Sac is to be saved externally as an **Output Centerline (.CL) file**. If so, this setting determines which end of the Cul-de-Sac is the starting and which is the ending station of the new Centerline (.CL) file.

Center Station: Use this setting to precisely locate the center of the Cul-de-Sac along the Road Centerline. By default, the **Center Station** is the starting or ending station of the Centerline depending on whether the user has chosen **Start** or **End** as the desired **Cul-de-Sac Centerline Position**. The station for the center of the Cul-de-Sac may also be entered in the text box or may be specified using a **Delta** value. When using the **Delta** option, the Cul-de-Sac will be shifted the specified distance along the Centerline.

Cul-de-Sac Radius: Use this value to specify the radius of the Cul-de-Sac bulb. The **Cul-de-Sac Template ID** determines the point on the cross-section being affected by this setting.

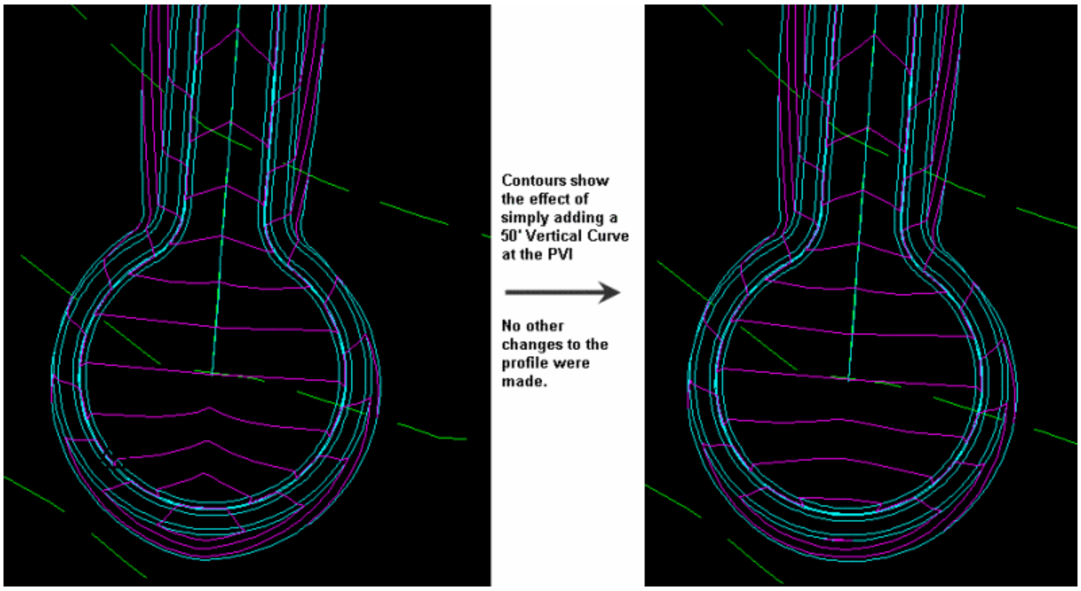
Fillet Radius: Use this value to specify the radius of the curve that transitions between the Road and the Cul-de-Sac.

The **Cul-de-Sac Template ID** determines the point on the cross-section being affected by this setting.
Offset: When set to "0", this setting places the center of the Cul-de-Sac on the Centerline of the Road. Setting this value to a negative(-), greater than "0" value will shift the center of the Cul-de-Sac left of the Centerline by that distance. A positive, greater than "0" value will shift it to the right by that distance.
Tear Drop Mode: Enabling this option creates a longer transition between the Road and the Cul-de-Sac. When enabled, a value larger than the **Cul-de-Sac Radius** must be entered as the **Setback**. An example of a "Tear Drop" Cul-de-Sac having a 45' radius and 75' setback is shown below.



Example of Tear Drop Cul-de-Sac

Template ID: This is the point on the cross-section used to define the horizontal (Centerline) and vertical (Profile) alignments around the bulb of the Cul-de-Sac. The Template ID may be specified as any point on the cross-section - such as edge of pavement (EP) or the back of curb (BC) - as long as it has been defined as a **Template ID** in the Template (.TPL) file used for the Road. Type the **Template ID** in the text box or use the **Select** button to choose from a list.
Profile Transition VC: When adding a Cul-de-Sac to the Road Network, the Profile around the Cul-de-Sac is automatically generated having 3 PVIs - one on each end connecting to the Road and one at the mid-point of the alignment. The **Profile Transition VC** setting is the default length of vertical curve inserted at the middle PVI of the Profile. As shown below, adding a vertical curve at this PVI can have a significant, positive impact on the resulting surface model and contours of the Road Network.

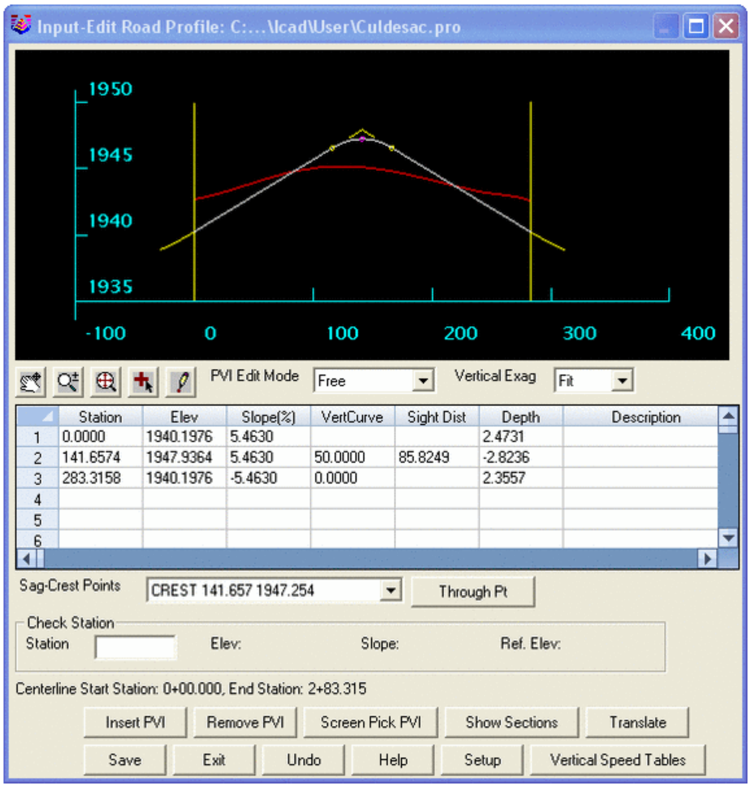


Contours show the effect of simply adding a 50' Vertical Curve at the PVI

No other changes to the profile were made.

Effect of Adding a Vertical Curve to Cul-de-Sac Profile

Edit Profile: Pick this button to open the **Input-Edit Road Profile** Editor and make changes to the Profile of the Cul-de-Sac. The **Cul-de-Sac Template ID** determines the point on the cross-section being represented in the Profile Editor. See **Road Network: Road Profile Editor** for more **Help** with this feature.



Input-Edit Road Profile: C:...\lcad\User\Culdesac.pro

1950
1945
1940
1935
-100
0
100
200
300
400

PVI Edit Mode: Free

Vertical Exag: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1940.1976	5.4630			2.4731	
2	141.6574	1947.9364	5.4630	50.0000	85.8249	-2.8236	
3	283.3158	1940.1976	-5.4630	0.0000		2.3557	
4							
5							
6							

Sag-Crest Points: CREST 141.657 1947.254

Check Station

Station: Elev: Slope: Ref. Elev:

Centerline Start Station: 0+00.000, End Station: 2+83.315

Through Pt
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Edit Profile for a Cul-de-Sac

Reset: Use this button to overwrite all edits to the Profile of the Cul-de-Sac and reset to the original Profile.

Template: Use this button to browse to and select an existing Cul-de-Sac Template (.TPL or .TSF) file. Specifying a different Template than the main Road allows the user to define different features for the Cul-de-Sac area such as sidewalk and curb.

Cul de Sac Output Files

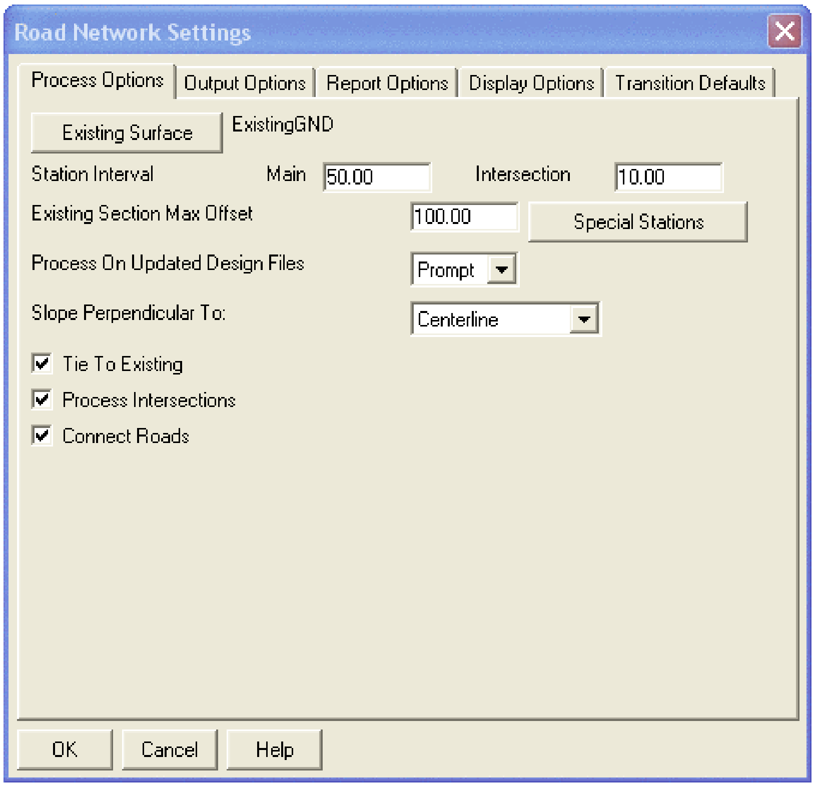
Centerline: Pick this button to output a Centerline (.CL) file representing the horizontal alignment around the Cul-de-Sac. The **Cul-de-Sac Template ID** determines the point on the cross-section exported to the Centerline (.CL) file.
Profile: Pick this button to output a Profile (.PRO) file representing the vertical alignment around the Cul-de-Sac. The **Cul-de-Sac Template ID** determines the point on the cross-section exported to the Profile (.PRO) file.
Existing Section File: : Pick this button to output an Existing Section (.SCT) file for the Cul-de-Sac.
Final Section File: Pick this button to output a Final Section (.SCT) file for the Cul-de-Sac.

Note: Driveways around a cul-de-sac can be easily added simply by drawing polylines for their centerlines and snapping them to the EOP of the cul-de-sac.

Step 1: Start Road Network and Configure Settings

Open a Drawing (.DWG) file containing the 2D zero-elevation polylines representing Road Centerlines for the project. Start the **Road Network** command and create a **New** Road Network (.RDN) file. After creating the Road Network file, the **Road Network Task Pane** loads as a docked dialog-box on the left side of the drawing screen.

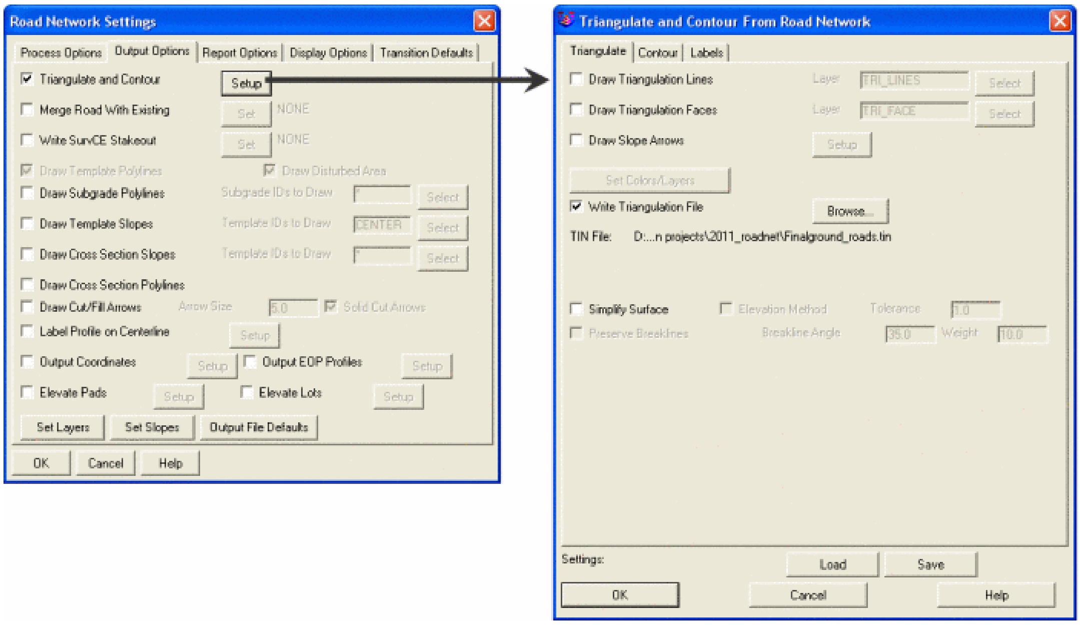
Configure the Road Network by *picking the **Settings** button* and displaying the **Road Network Settings** dialog box. In the **Process Options** tab, *pick the **Existing Surface** button* and browse to and select the Existing Ground Surface (.TIN or .FLT) file to be used for the project.



Existing Surface: ExistingGND
Station Interval Main 50.00 Intersection 10.00
Existing Section Max Offset 100.00
Process On Updated Design Files: Prompt
Slope Perpendicular To: Centerline
☑ Tie To Existing
☑ Process Intersections
☑ Connect Roads

Process Options Tab

Next, *switch to the **Output Options** tab* and *pick the **Setup** button* next to **Triangulate and Contour**. *Select the **Write Triangulation File** option* and then *pick the **Browse** button* to set the path and filename for the design Surface (.TIN) file for the Roads.



Road Network Settings

Process Options | Output Options | Report Options | Display Options | Transition Defaults

☑ Triangulate and Contour [Setup]
☐ Merge Road With Existing [Set] NONE
☐ Write SurvCE Stakeout [Set] NONE
☑ Draw Template Polylines ☑ Draw Disturbed Area
☐ Draw Subgrade Polylines Subgrade IDs to Draw * [Select]
☐ Draw Template Slopes Template IDs to Draw CENTER [Select]
☐ Draw Cross Section Slopes Template IDs to Draw * [Select]
☐ Draw Cross Section Polylines
☐ Draw Cut/Fill Arrows Arrow Size 5.0 ☑ Solid Cut Arrows
☐ Label Profile on Centerline [Setup]
☐ Output Coordinates [Setup] ☐ Output EOP Profiles [Setup]
☐ Elevate Pads [Setup] ☐ Elevate Lots [Setup]

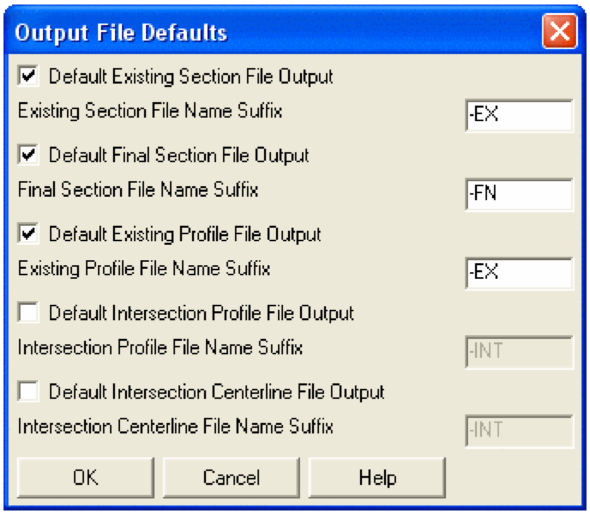
Triangulate and Contour From Road Network

Triangulate | Contour | Labels

☐ Draw Triangulation Lines Layer TRI_LINES [Select]
☐ Draw Triangulation Faces Layer TRI_FACE [Select]
☐ Draw Slope Arrows [Setup]
☑ Write Triangulation File [Browse...]
TIN File: D:...n projects\2011_roadnet\Finalground_roads.tin
☐ Simplify Surface ☐ Elevation Method Tolerance 1.0
☐ Preserve Breaklines Breakline Angle 35.0 Weight 10.0

Output Options Tab

Also in the **Output Options** tab, *pick the **Output File Defaults** button* to display the **Output File Defaults** dialog box. *Pick the **Output File Defaults** button* to specify additional Centerline (.CL), Profile (.PRO) and Section (.SCT) files to be saved when Processing the Road Network.

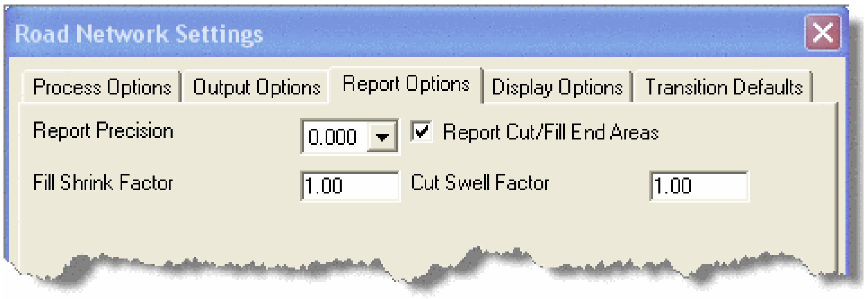


Output File Defaults

☑ Default Existing Section File Output
Existing Section File Name Suffix: -EX
☑ Default Final Section File Output
Final Section File Name Suffix: -FN
☑ Default Existing Profile File Output
Existing Profile File Name Suffix: -EX
☐ Default Intersection Profile File Output
Intersection Profile File Name Suffix: -INT
☐ Default Intersection Centerline File Output
Intersection Centerline File Name Suffix: -INT

Output File Defaults Dialog Box

Next, review the **Report Options**, **Display Options** and **Transition Defaults** tabs of the **Road Network Settings** dialog box and make any necessary changes.


Road Network Settings
Process Options
Output Options
Report Options
Display Options
Transition Defaults

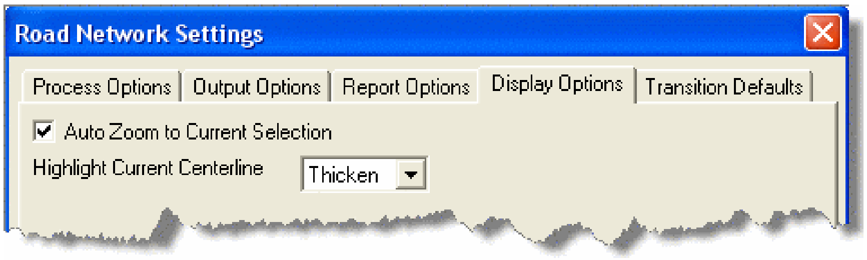
Report Precision 0.000

☑ Report Cut/Fill End Areas

Fill Shrink Factor 1.00

Cut Swell Factor 1.00

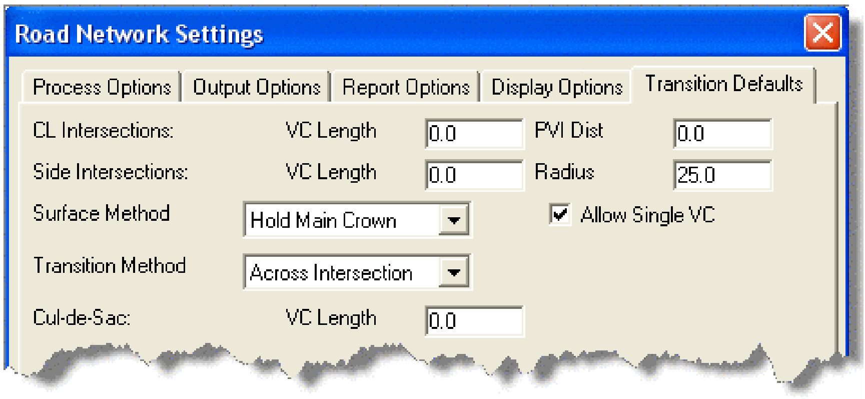
Report Options Tab


Road Network Settings
Process Options
Output Options
Report Options
Display Options
Transition Defaults

☑ Auto Zoom to Current Selection

Highlight Current Centerline Thicken

Display Options Tab


Road Network Settings
Process Options
Output Options
Report Options
Display Options
Transition Defaults

CL Intersections: VC Length 0.0 PVI Dist 0.0

Side Intersections: VC Length 0.0 Radius 25.0

Surface Method Hold Main Crown

☑ Allow Single VC

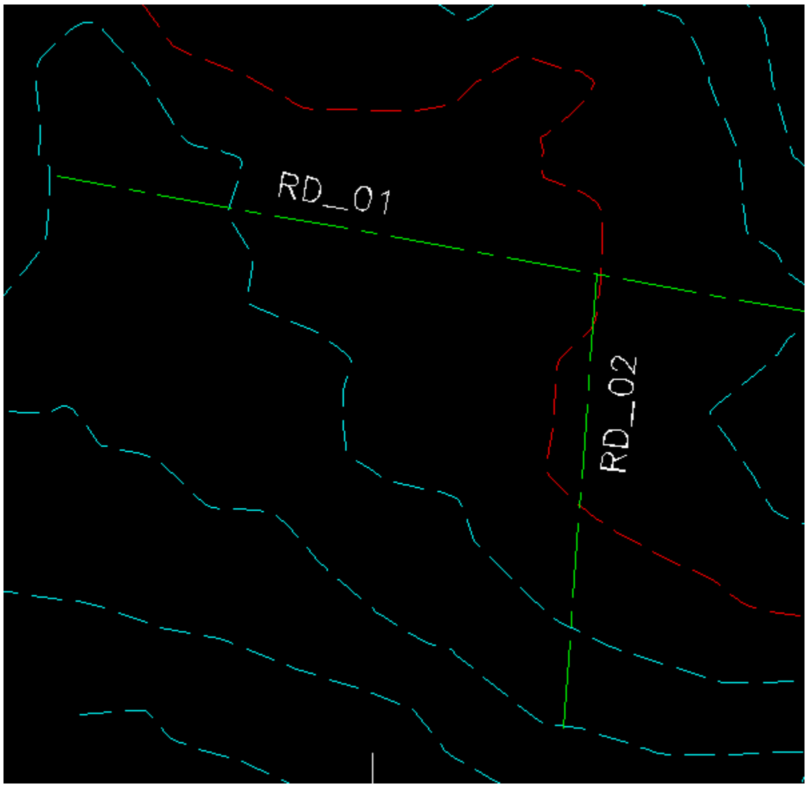
Transition Method Across Intersection

Cul-de-Sac: VC Length 0.0

Transition Defaults Tab

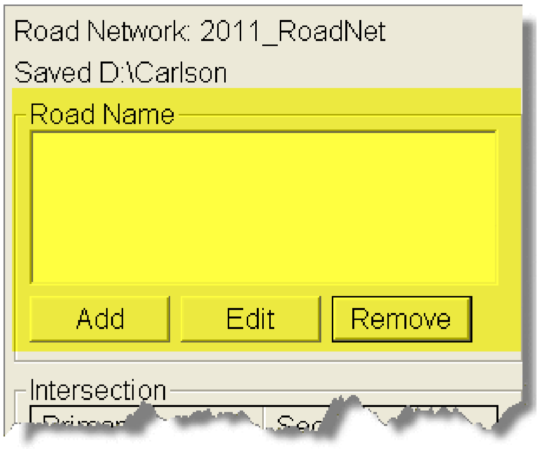
*Pick the **OK** button* to close the **Road Network Settings** dialog box and then *pick the **Save** button* on the **Task Pane** to save the settings to the Road Network (.RDN) file.

Step 2: Add Roads to the Network



RD_01 and RD_02

In the **Road Name** area of the **Road Network Task Pane**, *pick the **Add** button*.

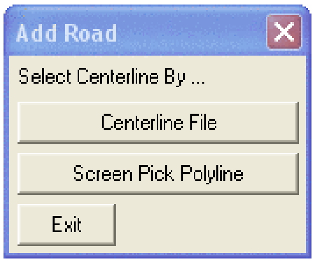


Road Network: 2011_RoadNet
Saved D:\Carlson

Road Name
Add
Edit
Remove
Intersection

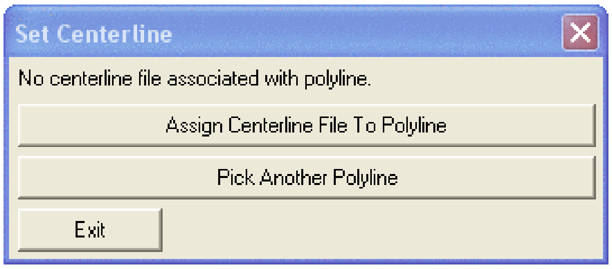
Road Name Area of the Road Network Task Pane

After picking the **Add** button, the **Add Road** dialog box provides two methods for adding a Road to the Network. *Pick the **Screen Pick Polyline** button*.


Add Road
Select Centerline By ...
Centerline File
Screen Pick Polyline
Exit

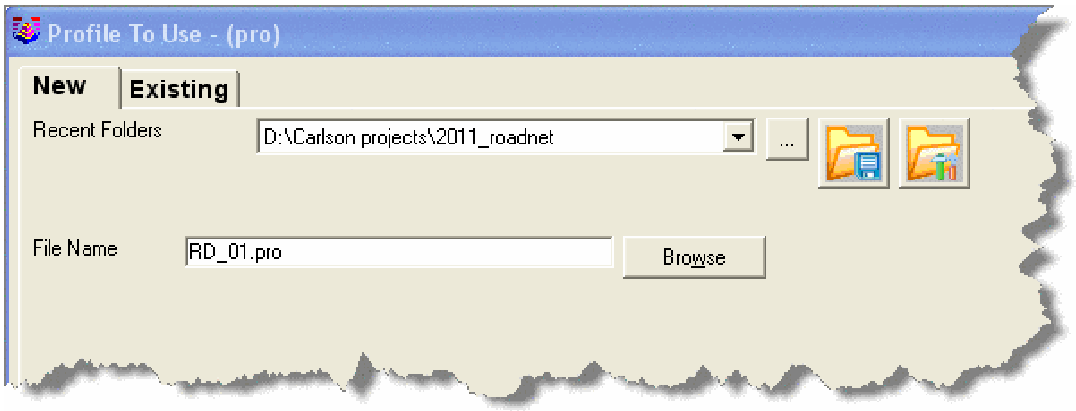
Specify Method to Use to Add Road

The prompts then switch to the Command: line where you are prompted to *Select Centerline Polyline* in the drawing. At the next prompt, *pick the **Assign Centerline File to Polyline** button* and set the path and filename for the new Centerline (.CL) file.


Set Centerline
No centerline file associated with polyline.
Assign Centerline File To Polyline
Pick Another Polyline
Exit

Set Centerline Dialog Box

Immediately after creating the new Centerline file, the **Profile to Use** file dialog box is displayed. In this box, you must set the path and filename for the proposed Profile (.PRO) file for the Road. By default, the new Profile (.PRO) file is named the same as the Centerline (.CL) file.

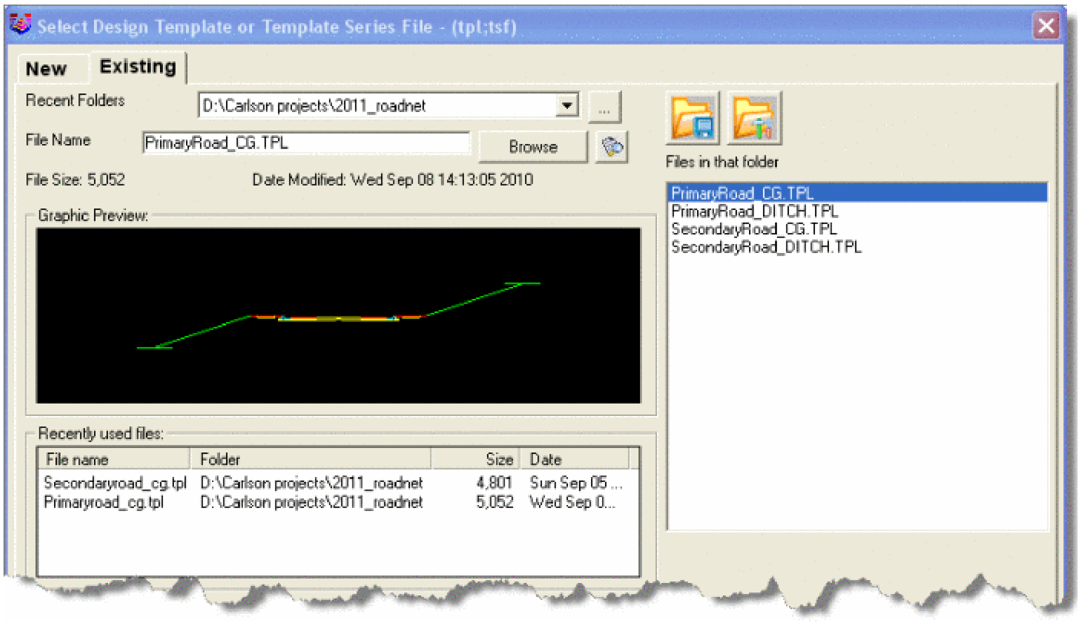

Profile To Use - (pro)
New
Existing
...
Browse

Recent Folders: D:\Carlson projects\2011_roadnet

File Name: RD_01.pro

Profile to Use File Dialog Box

After specifying the Centerline (.CL) and Profile (.PRO) files for the Road, the **Edit Road** dialog box is displayed. The only other **Required Input File** is a Template (.TPL) file. *Pick the **Template** button* to browse to and select the desired Template file.



Recent Folders: D:\Carlson projects\2011_roadnet

File Name: PrimaryRoad_CG.TPL

File Size: 5,052 Date Modified: Wed Sep 08 14:13:05 2010

Graphic Preview:

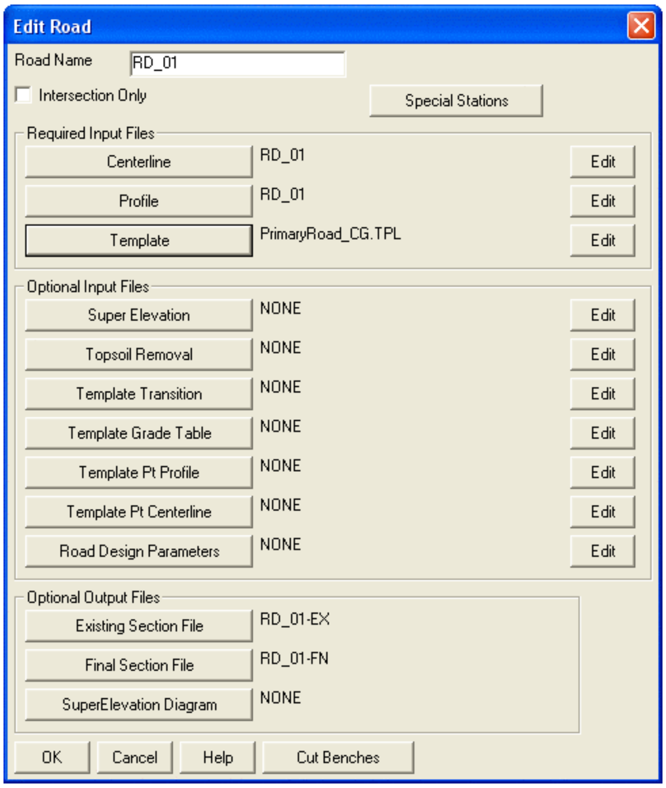
Files in that folder:
- PrimaryRoad_CG.TPL
- PrimaryRoad_DITCH.TPL
- SecondaryRoad_CG.TPL
- SecondaryRoad_DITCH.TPL

Recently used files:

File name	Folder	Size	Date
Secondaryroad_cg.tpl	D:\Carlson projects\2011_roadnet	4,801	Sun Sep 05 ...
Primaryroad_cg.tpl	D:\Carlson projects\2011_roadnet	5,052	Wed Sep 0...

Select Template (.TPL) file Dialog Box

The **Edit Road** dialog box serves as the "manager" for all files relating to the specific Road. The **Edit** button in the **Road Name** area of the **Road Network: Task Pane** also displays the **Edit Road** dialog box.



Road Name: RD_01

☐ Intersection Only

Required Input Files

Centerline	RD_01
Profile	RD_01
Template	PrimaryRoad_CG.TPL

Optional Input Files

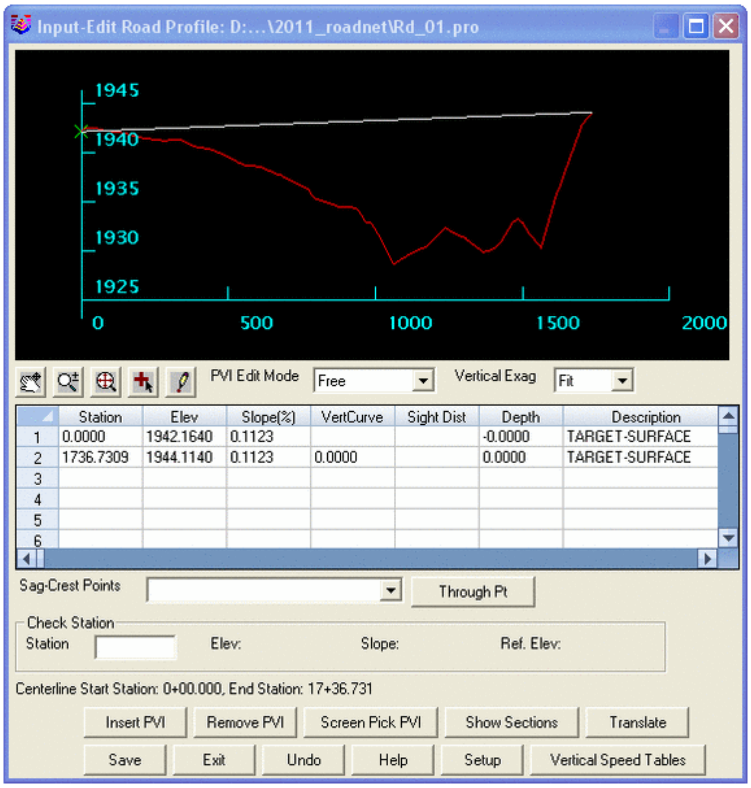
Super Elevation	NONE
Topsoil Removal	NONE
Template Transition	NONE
Template Grade Table	NONE
Template Pt Profile	NONE
Template Pt Centerline	NONE
Road Design Parameters	NONE

Optional Output Files

Existing Section File	RD_01-EX
Final Section File	RD_01-FN
SuperElevation Diagram	NONE

Edit Road Dialog Box

*Pick the **Edit** button* to the right of the **Profile** button to open the **Road Profile Editor**.


Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro
1945
1940
1935
1930
1925
0
500
1000
1500
2000

PVI Edit Mode: Free

Vertical Exag: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	0.1123			-0.0000	TARGET-SURFACE
2	1736.7309	1944.1140	0.1123	0.0000		0.0000	TARGET-SURFACE
3							
4							
5							
6							

Sag-Crest Points

Check Station

Station: Elev: Slope: Ref. Elev:

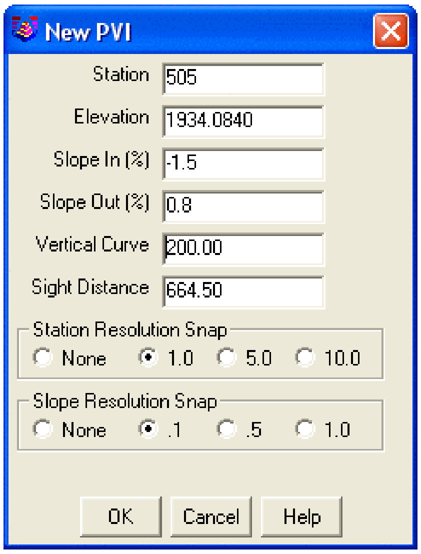
Centerline Start Station: 0+00.000, End Station: 17+36.731

Through Pt
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Input-Edit Road Profile Editor

In Carlson's **Road Network** feature, the initial design Profile is automatically generated and has only a starting and ending PVI - with the elevation at both ends tying into existing ground. The movement of the crosshairs is locked to the design Profile. The initial PVIs can be seen in the profile-grid-view where the existing ground Profile is shown in red and the design Profile in white. The initial PVIs are shown in the table-view with the "PVI Description" indicating the PVI elevation is tied to the "TARGET-SURFACE" (existing ground).

Pick the ***Add PVI*** *button* to create a new PVI by screen-picking a point in the profile-grid-view at the top. After picking the **Add PVI** button, the **New PVI** dialog box is displayed.


New PVI

Station: 505

Elevation: 1934.0840

Slope In (%): -1.5

Slope Out (%): 0.8

Vertical Curve: 200.00

Sight Distance: 664.50

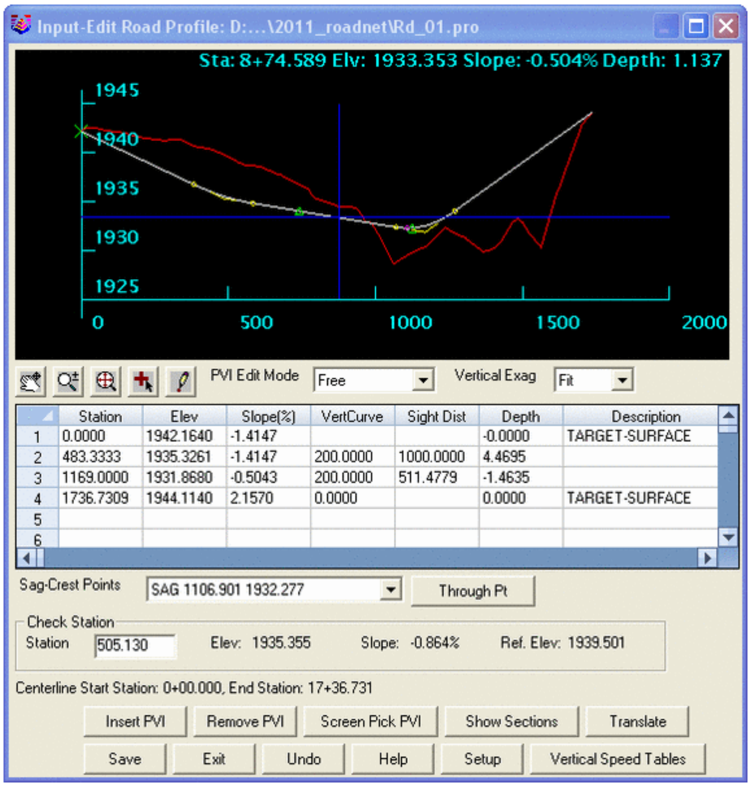
Station Resolution Snap: ○ None ● 1.0 ○ 5.0 ○ 10.0

Slope Resolution Snap: ○ None ● .1 ○ .5 ○ 1.0

OK
Cancel
Help

New PVI Dialog Box

*Enter a length for a vertical curve or change other settings as desired and then pick the **OK** button.* Repeat as needed for additional PVIs and vertical curves.


Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro
1945
1940
1935
1930
1925
0
500
1000
1500
2000
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Sta: 8+74.589 Elv: 1933.353 Slope: -0.504% Depth: 1.137

PVI Edit Mode: Free
Vertical Exag: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	-1.4147			-0.0000	TARGET-SURFACE
2	483.3333	1935.3261	-1.4147	200.0000	1000.0000	4.4695	
3	1169.0000	1931.8680	-0.5043	200.0000	511.4779	-1.4635	
4	1736.7309	1944.1140	2.1570	0.0000		0.0000	TARGET-SURFACE
5							
6							

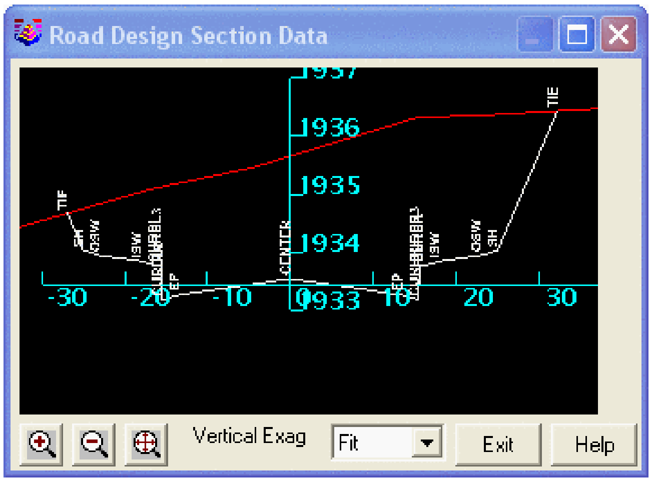
Sag-Crest Points: SAG 1106.901 1932.277 Through Pt

Check Station
Station: 505.130 Elev: 1935.355 Slope: -0.864% Ref. Elev: 1939.501

Centerline Start Station: 0+00.000, End Station: 17+36.731

Input-Edit Road Profile Editor

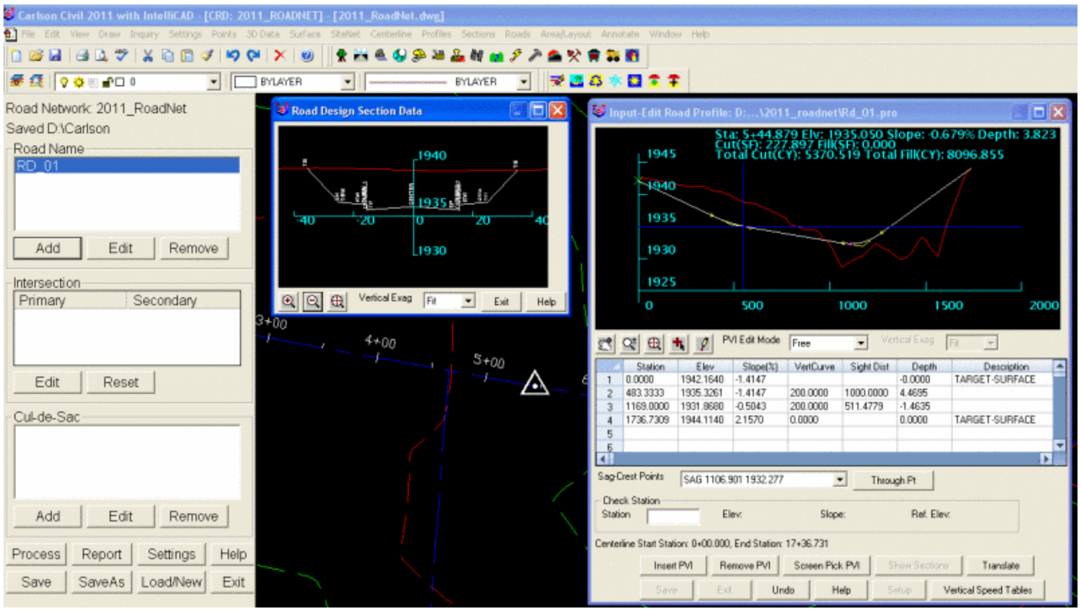
*Pick the **Show Sections** button* at the bottom of the **Road Profile Editor** to display a **Section View** of the Road. Moving your crosshairs along the design Profile dynamically updates the **Section View**.


Road Design Section Data
1937
1936
1935
1934
1933
-30
-20
-10
10
20
30
TIE
CENTER
EP
SW
Exit
Help

Vertical Exag: Fit

Section Viewer

When the **Section View** window is open and active, the **Road Profile Editor** also remains open and active. If you position the **Road Profile Editor** and the **Section View** window so that the drawing view of the Road is unobscured, you can move your crosshairs along the design Profile and have a dynamic design environment allowing you to see the plan-, profile- and section-views at one time. Additionally, when the **Section View** window is open, the notes at the top of the profile-grid-view include the "Cut" and "Fill" end-area at the current station along with the "Cut" and "Fill" volume for the entire Road. These calculations are dynamic and will update if changes are made to the design Profile.


Carlson Civil 2011 with IntelliCAD - [CRD: 2011_ROADNET] - [2011_RoadNet.dwg]
File Edit View Draw Inquiry Settings Points 3D Data Surface SiteNet Centerline Profiles Sections Roads Area/Layout Annotate Window Help
BYLAYER
BYLAYER
Road Name
Add
Edit
Remove
Intersection
Primary
Secondary
Edit
Reset
Cul-de-Sac
Add
Edit
Remove
Process
Report
Settings
Help
Save
SaveAs
Load/New
Exit
Road Design Section Data
1940
1935
1930
-40
-20
0
20
40
Vertical Exag
Fit
Exit
Help
3+00
4+00
5+00
Input-Edit Road Profile: D:...\2011_roadnet\Rd_01.pro
1945
1940
1935
1930
1925
0
500
1000
1500
2000
PVI Edit Mode
Free
Vertical Exag
Fit
Sag-Crest Points
Through Pt
Check Station
Station
Elev:
Slope:
Ref. Elev:
Insert PVI
Remove PVI
Screen Pick PVI
Show Sections
Translate
Save
Exit
Undo
Help
Setup
Vertical Speed Tables

Road Network: 2011_RoadNet
Saved D:\Carlson

RD_01

Sta: 5+44.879 Elv: 1935.050 Slope: -0.679% Depth: 3.823
Cut(SF): 227.897 Fill(SF): 0.000
Total Cut(CY): 5370.519 Total Fill(CY): 8096.855

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Depth	Description
1	0.0000	1942.1640	-1.4147			-0.0000	TARGET-SURFACE
2	483.3333	1935.3261	-1.4147	200.0000	1000.0000	4.4695	
3	1169.0000	1931.8680	-0.5043	200.0000	511.4779	-1.4635	
4	1736.7309	1944.1140	2.1570	0.0000		0.0000	TARGET-SURFACE
5							
6							

Sag-Crest Points: SAG 1106.901 1932.277

Centerline Start Station: 0+00.000, End Station: 17+36.731

Road Profile View and Section Viewer with Station Indicator in Drawing

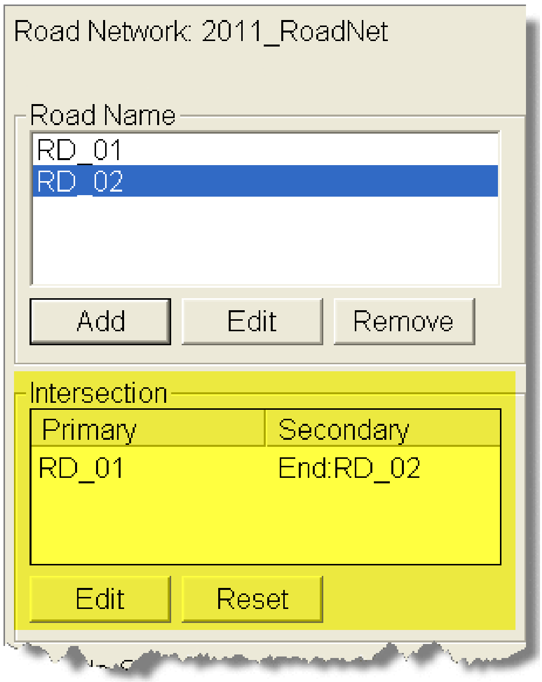
*Pick the **Exit** button* to close the **Section Viewer** and then *pick the **Save** button* in the **Road Profile Editor** to save changes to the Profile (.PRO) file. *Pick the **Exit** button* to close the **Road Profile Editor.**.

Repeat the steps above to define additional Roads in the Network.

See **Road Network: Adding and Editing Roads** if you need additional assistance.

Step 3: Adding and Editing Intersections

After Adding the next Road, the **Road Network** command recognizes the creation of an Intersection and the Primary and Secondary Roads are displayed in the **Intersection** area of the **Road Network Task Pane**.



Road Network: 2011_RoadNet

Road Name
- RD_01
- RD_02

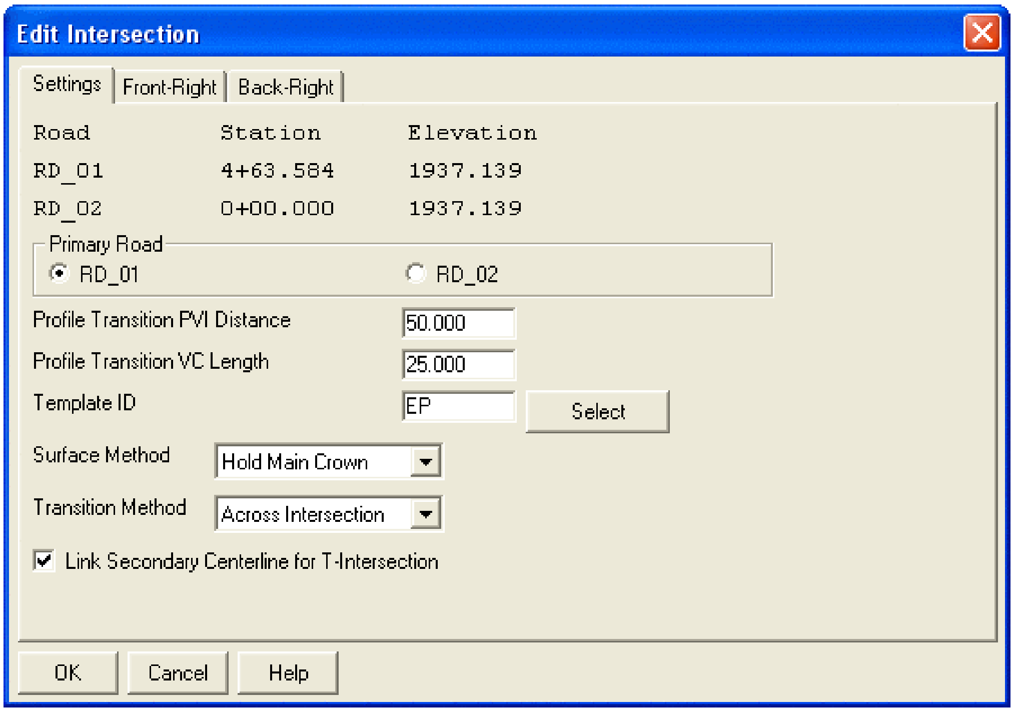
Intersection

Primary	Secondary
RD_01	End:RD_02

Intersection Area of the Road Network Task Pane

Select the Intersection and *pick the **Edit** button* to display the **Settings** tab of the **Edit Intersection** dialog box. Make changes as needed.

Note: Changes made here apply to all Corners of the Intersection.



Edit Intersection

Road	Station	Elevation
RD_01	4+63.584	1937.139
RD_02	0+00.000	1937.139

Primary Road
● RD_01 ○ RD_02

Profile Transition PVI Distance: 50.000

Profile Transition VC Length: 25.000

Template ID: EP

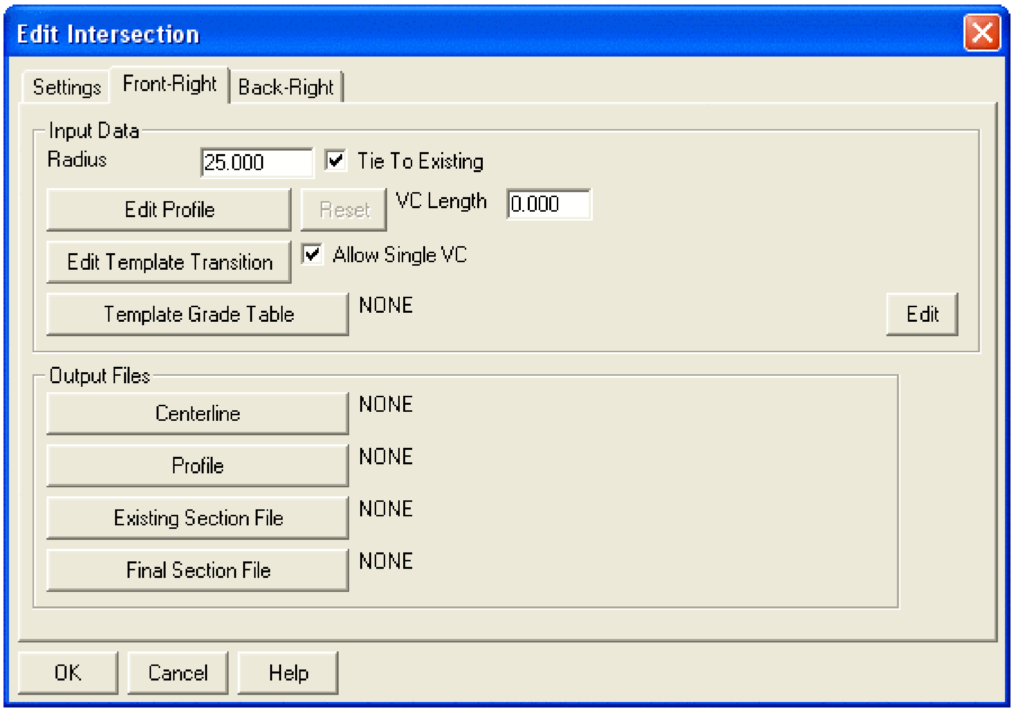
Surface Method: Hold Main Crown

Transition Method: Across Intersection

☑ Link Secondary Centerline for T-Intersection

The Settings Tab of the Edit Intersection Dialog Box

Or, you can switch to one of the **Corner tabs - *Front-Right*, *Back-Right*, *Front-Left*, *Back-Left*** to make changes to only one Corner of the Intersection.


Edit Intersection

Input Data

Radius 25.000 ☑ Tie To Existing

VC Length 0.000

☑ Allow Single VC

Template Grade Table NONE

Output Files

Centerline NONE

Profile NONE

Existing Section File NONE

Final Section File NONE

Settings
Front-Right
Back-Right
Edit Profile
Reset
Edit Template Transition
Edit
OK
Cancel
Help

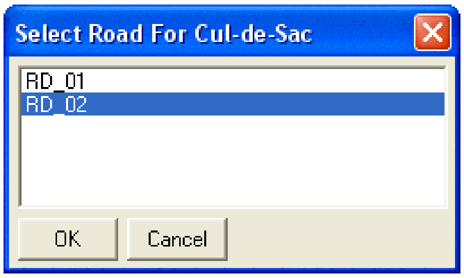
One of the "Corner" Tabs of the Edit Intersection Dialog Box

*Pick the **OK** button* to close the **Edit Intersection** box and save changes.

See **Road Network: Adding and Editing Intersections** if you need additional assistance.

Step 4: Adding and Editing Cul-de-Sacs

*Pick the **Add** button* in the **Cul-de-Sac** area of the **Road Network Task Pane** to display a dialog box listing the Roads in the Network and prompting you to **Select Road for Cul-de-Sac**.

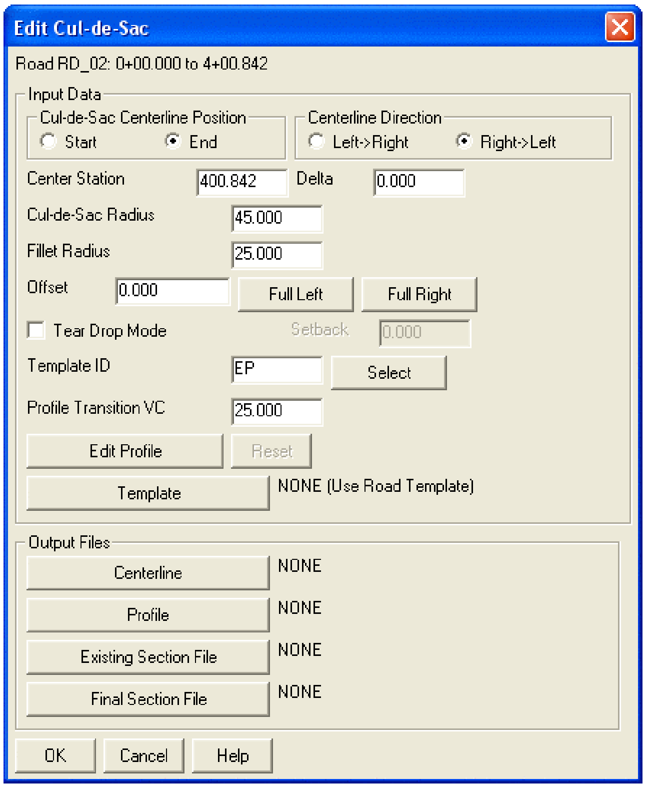

Select Road For Cul-de-Sac

RD_01

RD_02

Select Road for Cul-de-Sac

After choosing the Road and picking the **OK** button, the **Edit Cul-de-Sac** dialog box is displayed. At a minimum, you must *enter a **Cul-de-Sac Radius** and **Fillet Radius*** to define the Cul-de-Sac.



Edit Cul-de-Sac

Road RD_02: 0+00.000 to 4+00.842

Input Data

Cul-de-Sac Centerline Position: ○ Start ● End

Centerline Direction: ○ Left->Right ● Right->Left

Center Station 400.842 Delta 0.000

Cul-de-Sac Radius 45.000

Fillet Radius 25.000

Offset 0.000

☐ Tear Drop Mode Setback 0.000

Template ID EP

Profile Transition VC 25.000

Template: NONE (Use Road Template)

Output Files

Centerline: NONE

Profile: NONE

Existing Section File: NONE

Final Section File: NONE

Full Left
Full Right
Select
Edit Profile
Reset
Template
Centerline
Profile
Existing Section File
Final Section File
OK
Cancel
Help

Edit Cul-de-Sac Dialog Box

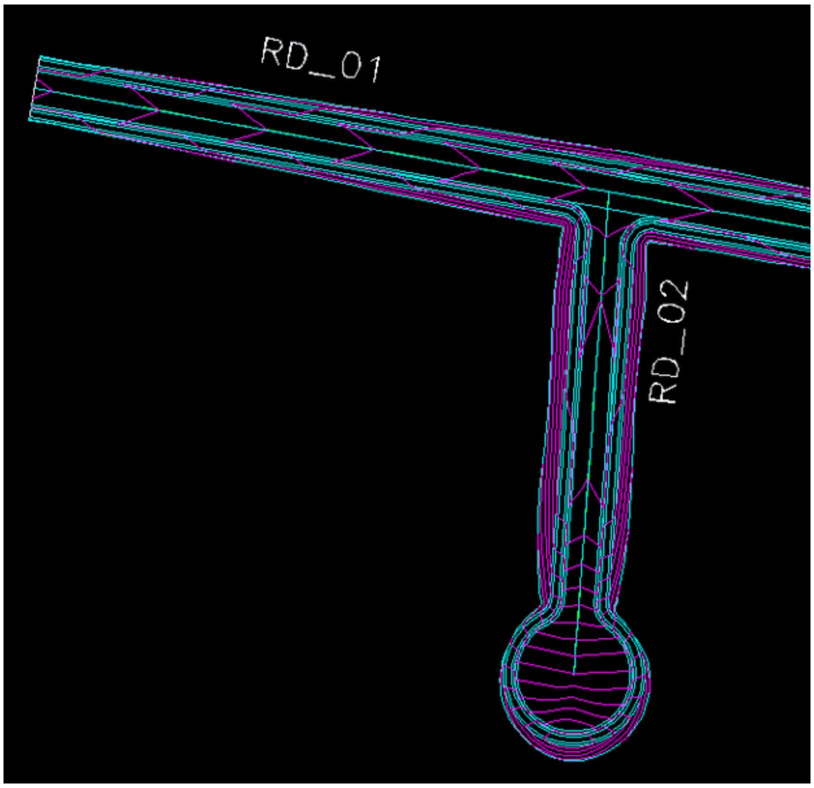
*Pick the **OK** button* to close the **Edit Cul-de-Sac** box and save changes.

See **Road Network: Adding and Editing Cul-de-Sacs** if you need additional assistance.

Step 5: Save, Process and View the Road Network

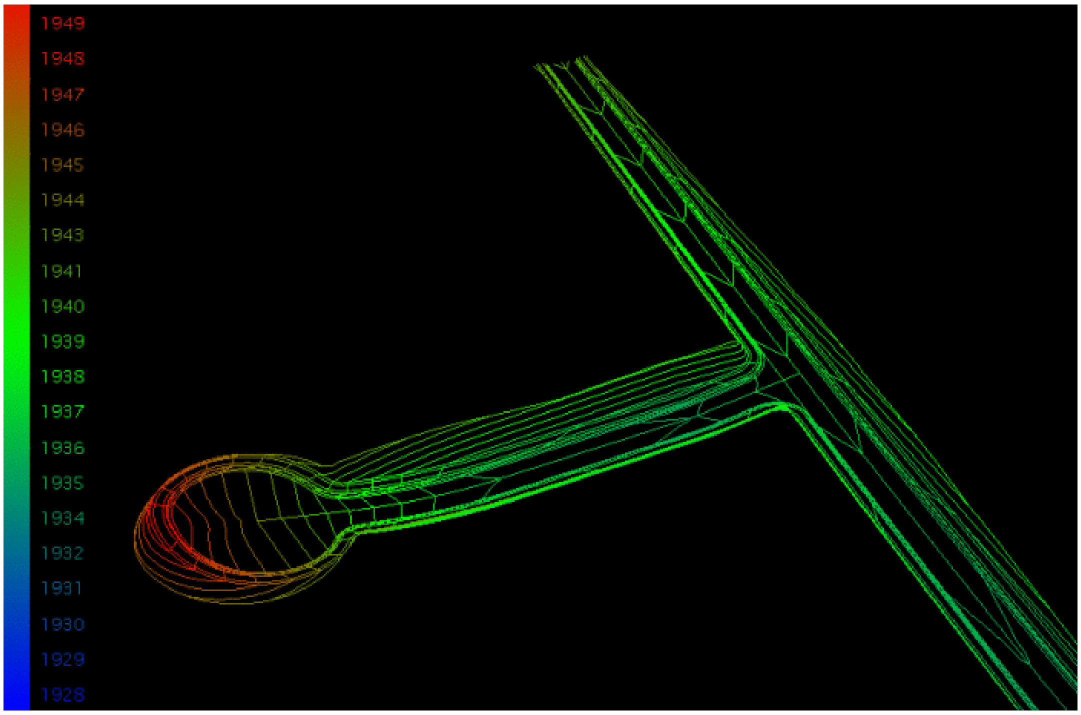
*Pick the **Save** button* on the **Road Network Task Pane** to **Save** the Road Network (.RDN) file.

Then, *pick the **Process** button* on the **Road Network Task Pane** to calculate the road design and perform the functions specified in **Road Network Output Options**. The resulting contours and breaklines are shown below.



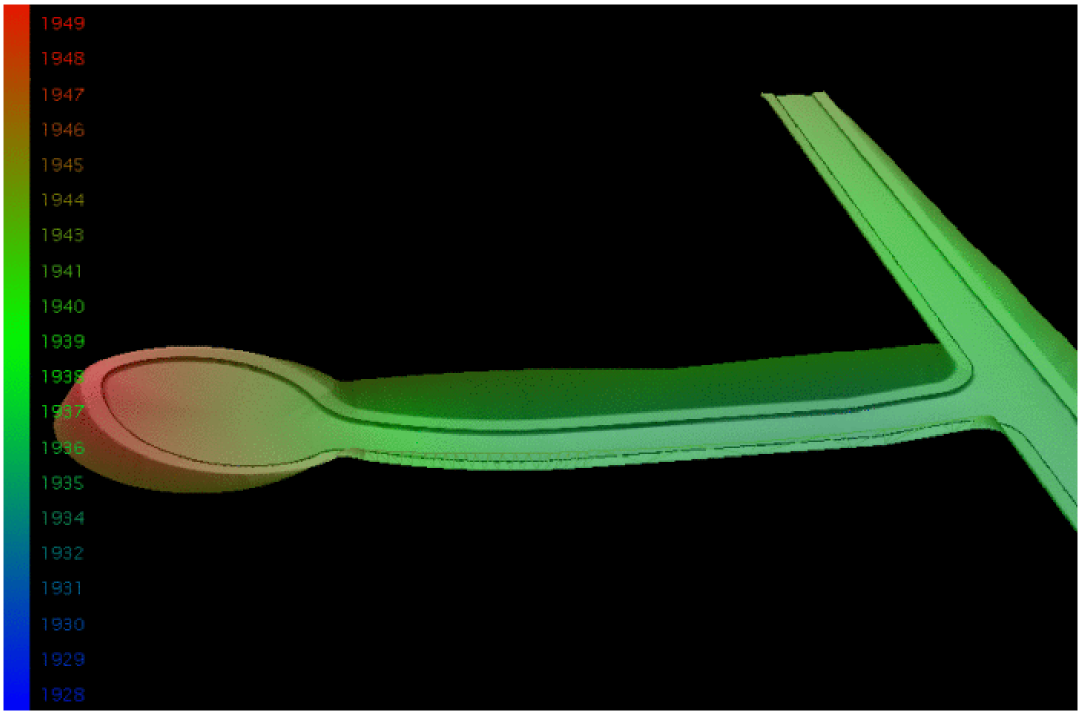
Contours and Breaklines After Processing Road Network

The elevated breaklines and contours can now be viewed using the **3D Viewer Window** command as shown below.


1949
1948
1947
1946
1945
1944
1943
1941
1940
1939
1938
1937
1936
1935
1934
1932
1931
1930
1929
1928

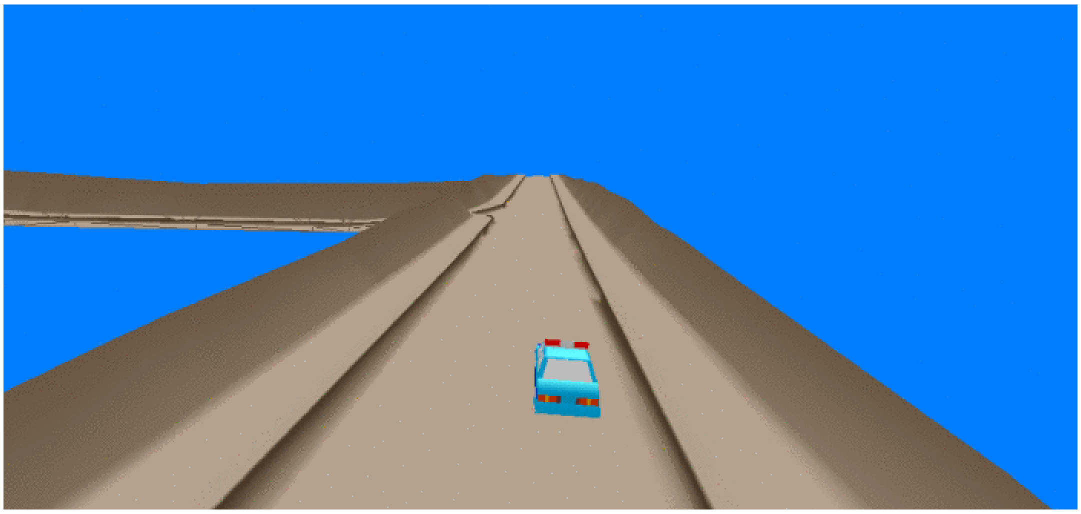
Breaklines and Contours as Seen in the 3D Viewer Window

Or, use the **Surface 3D Viewer** command to view the Surface (.TIN) file as shown below.


1949
1948
1947
1946
1945
1944
1943
1941
1940
1939
1938
1937
1936
1935
1934
1932
1931
1930
1929
1928

Surface (.TIN) File as Seen in the Surface 3D Viewer

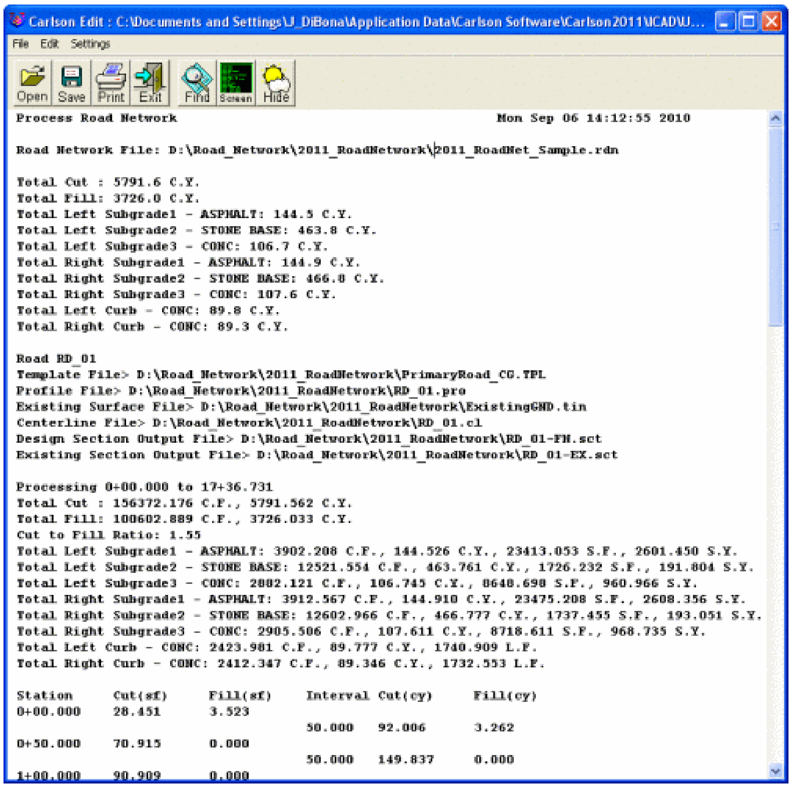
Or, use the **Surface 3D Flyover** command to drive the Surface (.TIN) file as shown below.



Surface (.TIN) File in the Surface 3D Flyover Command

Step 6: Reports

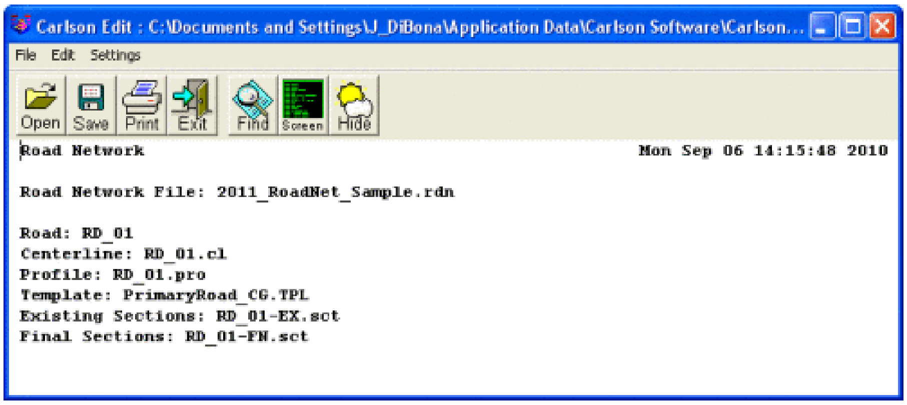
*Pick the **Report** button* on the **Road Network Task Pane**. Then, *pick the **Output Processing** button* to display the report. This report displays the cut/fill and material quantities for each Road, Intersection and Cul-de-Sac of the Road Network.


Carlson Edit : C:\Documents and Settings\J_DiBona\Application Data\Carlson Software\Carlson2011\ICAD\J...
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Process Road Network                                          Mon Sep 06 14:12:55 2010

Road Network File: D:\Road_Network\2011_RoadNetwork\2011_RoadNet_Sample.rdn

Total Cut : 5791.6 C.Y.
Total Fill: 3726.0 C.Y.
Total Left Subgrade1 - ASPHALT: 144.5 C.Y.
Total Left Subgrade2 - STONE BASE: 463.8 C.Y.
Total Left Subgrade3 - CONC: 106.7 C.Y.
Total Right Subgrade1 - ASPHALT: 144.9 C.Y.
Total Right Subgrade2 - STONE BASE: 466.8 C.Y.
Total Right Subgrade3 - CONC: 107.6 C.Y.
Total Left Curb - CONC: 89.8 C.Y.
Total Right Curb - CONC: 89.3 C.Y.

Road RD_01
Template File> D:\Road_Network\2011_RoadNetwork\PrimaryRoad_CG.TPL
Profile File> D:\Road_Network\2011_RoadNetwork\RD_01.pro
Existing Surface File> D:\Road_Network\2011_RoadNetwork\ExistingGND.tin
Centerline File> D:\Road_Network\2011_RoadNetwork\RD_01.cl
Design Section Output File> D:\Road_Network\2011_RoadNetwork\RD_01-FN.sct
Existing Section Output File> D:\Road_Network\2011_RoadNetwork\RD_01-EX.sct

Processing 0+00.000 to 17+36.731
Total Cut : 156372.176 C.F., 5791.562 C.Y.
Total Fill: 100602.889 C.F., 3726.033 C.Y.
Cut to Fill Ratio: 1.55
Total Left Subgrade1 - ASPHALT: 3902.208 C.F., 144.526 C.Y., 23413.053 S.F., 2601.450 S.Y.
Total Left Subgrade2 - STONE BASE: 12521.554 C.F., 463.761 C.Y., 1726.232 S.F., 191.804 S.Y.
Total Left Subgrade3 - CONC: 2882.121 C.F., 106.745 C.Y., 8648.698 S.F., 960.966 S.Y.
Total Right Subgrade1 - ASPHALT: 3912.567 C.F., 144.910 C.Y., 23475.208 S.F., 2608.356 S.Y.
Total Right Subgrade2 - STONE BASE: 12602.966 C.F., 466.777 C.Y., 1737.455 S.F., 193.051 S.Y.
Total Right Subgrade3 - CONC: 2905.506 C.F., 107.611 C.Y., 8718.611 S.F., 968.735 S.Y.
Total Left Curb - CONC: 2423.981 C.F., 89.777 C.Y., 1740.909 L.F.
Total Right Curb - CONC: 2412.347 C.F., 89.346 C.Y., 1732.553 L.F.

Station     Cut(sf)     Fill(sf)     Interval Cut(cy)     Fill(cy)
0+00.000    28.451      3.523
                                     50.000   92.006      3.262
0+50.000    70.915      0.000
                                     50.000   149.837     0.000
1+00.000    90.909      0.000
```

Road Network *Output Processing* Report

Repeat this step but, this time, *pick the **Input Data Files** button* to display the report. This report displays all of the user-specified design files associated with the Road Network. For this report, you are given the option of reporting only the filename or both the path and filename.


Carlson Edit : C:\Documents and Settings\J_DiBona\Application Data\Carlson Software\Carlson...
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Road Network                                          Mon Sep 06 14:15:48 2010

Road Network File: 2011_RoadNet_Sample.rdn

Road: RD_01
Centerline: RD_01.cl
Profile: RD_01.pro
Template: PrimaryRoad_CG.TPL
Existing Sections: RD_01-EX.sct
Final Sections: RD_01-FN.sct
```

Road Network *Input Data Files* Report

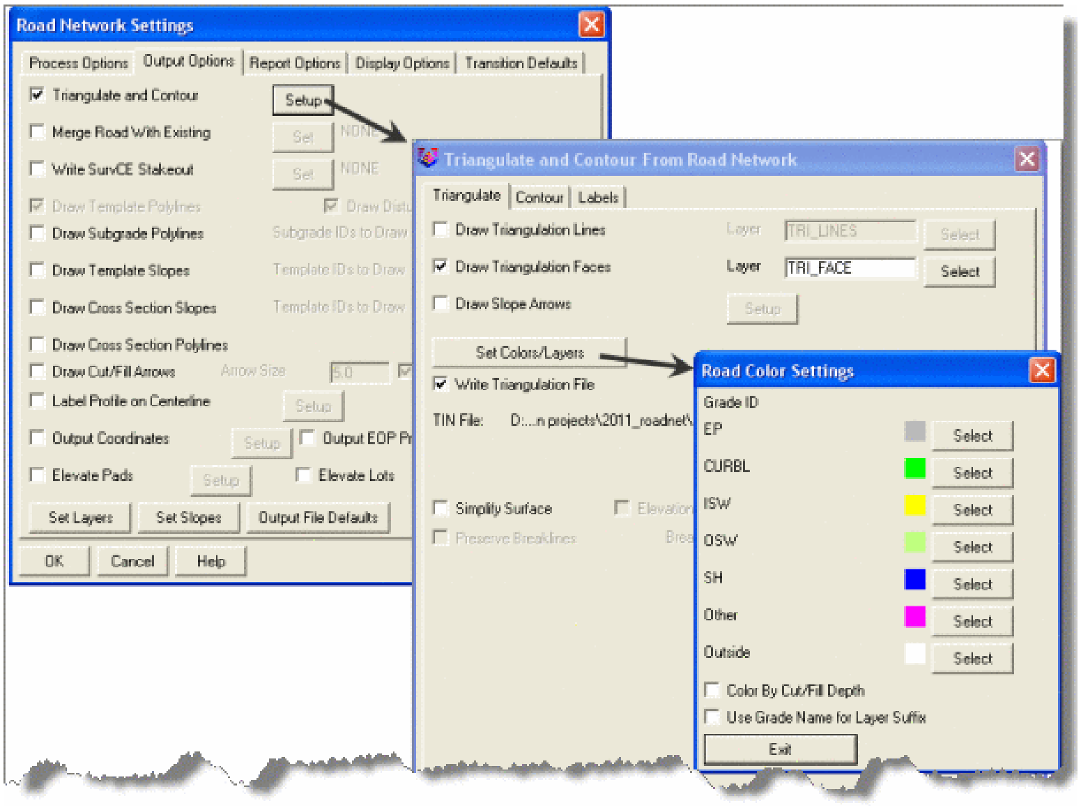
Step 7: Additional Settings and Tools in the Road Network

Draw Triangulation Faces with Color and View in 3D Viewer Window

*Pick the **Settings** button* on the **Road Network Task Pane** and then *pick the **Output Options** tab*. Now, *pick the **Setup** button* next to **Triangulate and Contour** to open the **Triangulate and Contour from Road Network** dialog box.

*Select the **Draw Triangulation Faces** option* and then *pick the **Set Colors/Layers** buttons* to display the

Road Color Settings dialog box (shown below). The color of the faces can be set either by using the **Template IDs** defined in the Template (.TPL) file or using a color range based on the "Cut & Fill Depths".


Road Network Settings
Process Options
Output Options
Report Options
Display Options
Transition Defaults
Setup
Set
Set
Setup
Setup
Setup
Set Layers
Set Slopes
Output File Defaults
OK
Cancel
Help
Triangulate and Contour From Road Network
Triangulate
Contour
Labels
Select
Select
Setup
Set Colors/Layers
Road Color Settings
Select
Select
Select
Select
Select
Select
Select
Exit

☑ Triangulate and Contour

☐ Merge Road With Existing NONE

☐ Write SurvCE Stakeout NONE

☑ Draw Template Polylines ☑ Draw Distu

☐ Draw Subgrade Polylines Subgrade IDs to Draw

☐ Draw Template Slopes Template IDs to Draw

☐ Draw Cross Section Slopes Template IDs to Draw

☐ Draw Cross Section Polylines

☐ Draw Cut/Fill Arrows Arrow Size 5.0 ☑

☐ Label Profile on Centerline

☐ Output Coordinates ☐ Output EOP Pt

☐ Elevate Pads ☐ Elevate Lots

☐ Draw Triangulation Lines Layer TRI_LINES

☑ Draw Triangulation Faces Layer TRI_FACE

☐ Draw Slope Arrows

☑ Write Triangulation File

TIN File: D:...n projects\2011_roadnet\

☐ Simplify Surface ☐ Elevation

☐ Preserve Breaklines Brea

Grade ID		
EP	⬜	Select
CURBL	🟩	Select
ISW	🟨	Select
OSW	🟩	Select
SH	🟦	Select
Other	🟪	Select
Outside	⬜	Select

☐ Color By Cut/Fill Depth

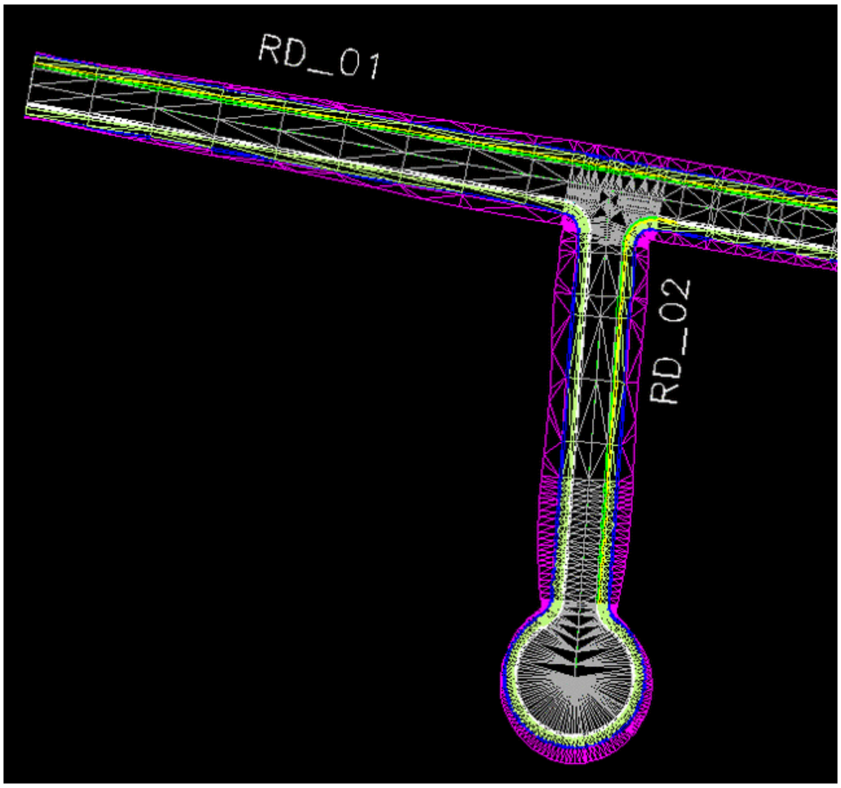
☐ Use Grade Name for Layer Suffix

Set Road Colors In the "Triangulate and Contour From Road Network" Dialog Box

*Pick the **Exit** button* to close the **Road Color Settings** box and then *pick the **OK** button* twice to exit both the **Triangulate and Contour** and **Road Network Settings** dialog boxes.

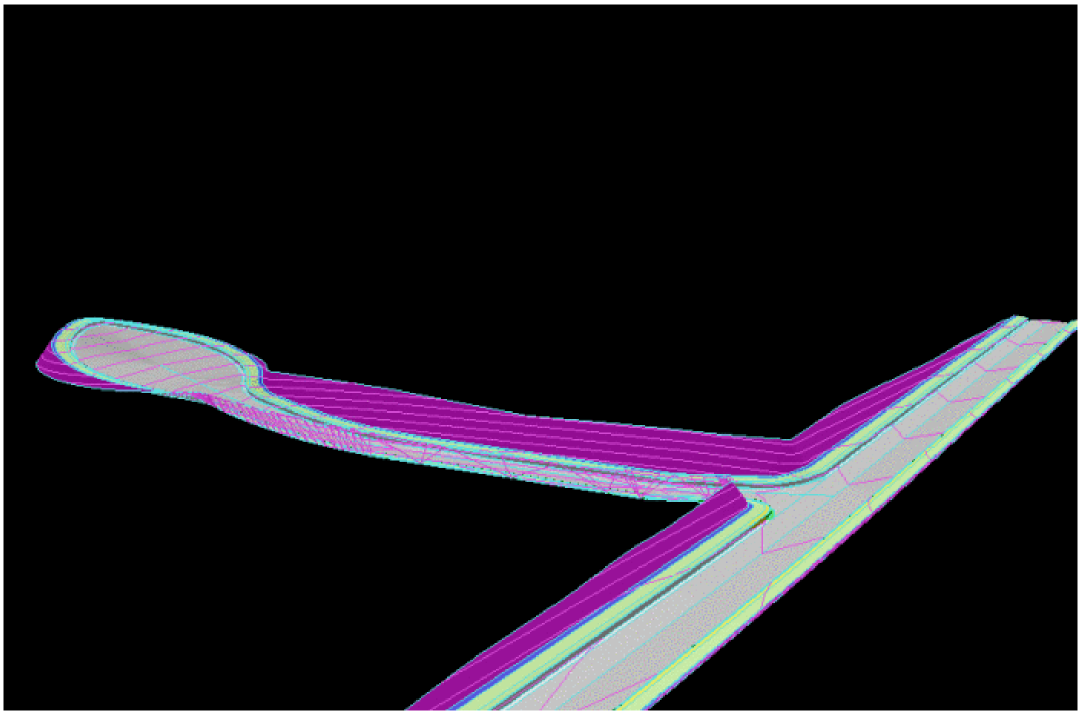
*Pick the **Save** button* on the **Road Network Task Pane** to **Save** the Road Network (.RDN) file.

Then, *pick the **Process** button* on the **Road Network Task Pane** to calculate the road design and perform the functions specified in **Road Network Output Options** The image below shows only the Triangulation Faces after Processing.



Triangulation Faces with Color After Processing Road Network

The elevated Triangulated Faces can now be viewed using the **3D Viewer Window** command as shown below.



Contours and Triangulation Faces with Color in the 3D Viewer Window

Merge Road with Existing

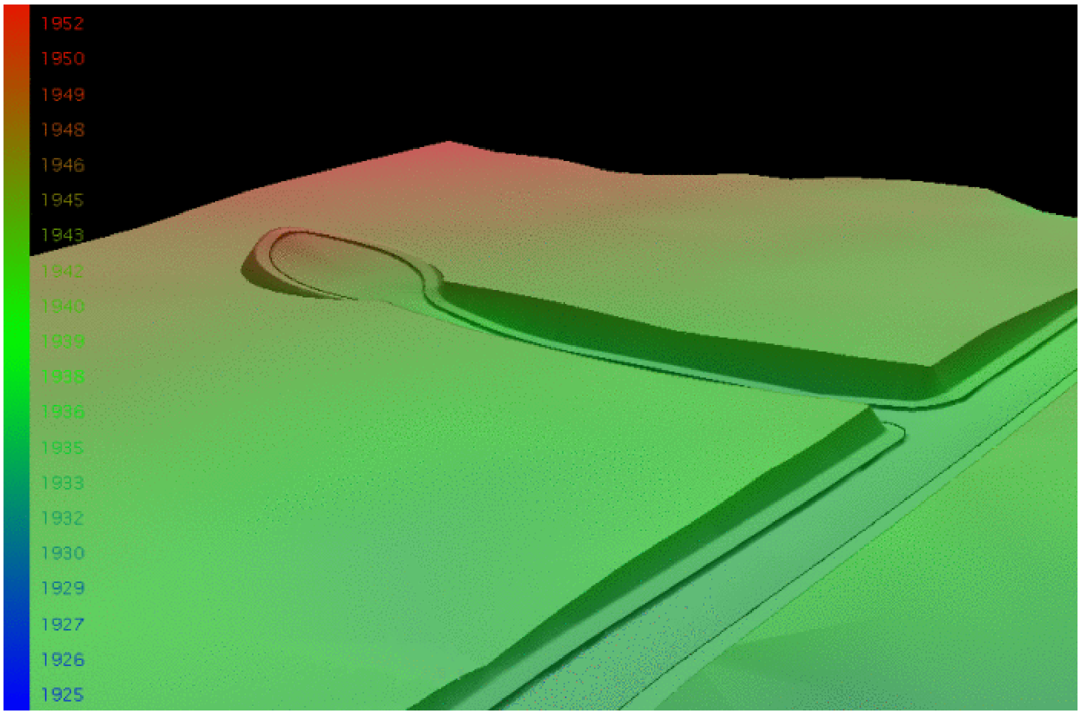
Pick the ***Settings*** *button* on the **Road Network Task Pane** and then *pick the* ***Output Options*** *tab. Select the* ***Merge Road with Existing*** *option* and then *pick the* ***Set*** *button* to set the path and filename of a 3rd Surface (.TIN) file to be created by combining the design Surface file and the Existing Ground Surface file.

Pick the ***OK*** *button* to close **Road Network Settings**.

Pick the ***Save*** *button* on the **Road Network Task Pane** to **Save** the Road Network (.RDN) file.

Then, *pick the* ***Process*** *button* on the **Road Network Task Pane** to calculate the road design and perform the functions specified in **Road Network Output Options**

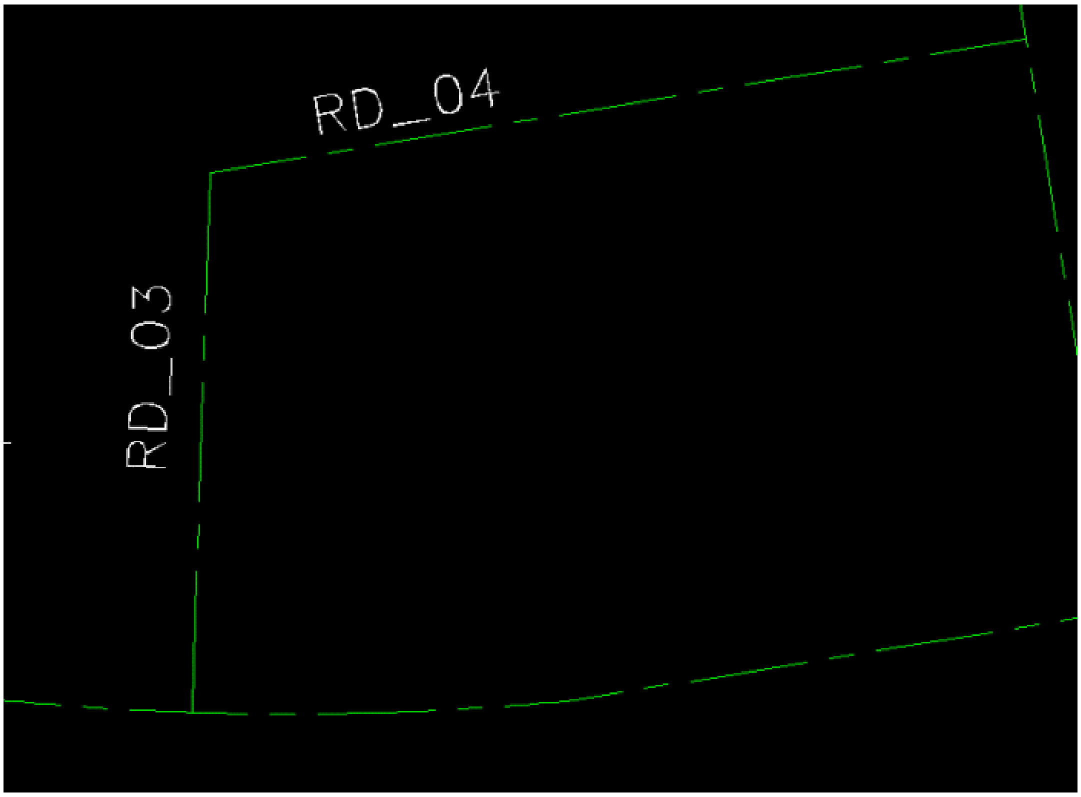
The combined Surface (.TIN) file can now be viewed using the **Surface 3D Viewer** command as shown below.



Merged Existing Ground and Road Surfaces in 3D Surface Viewer Window

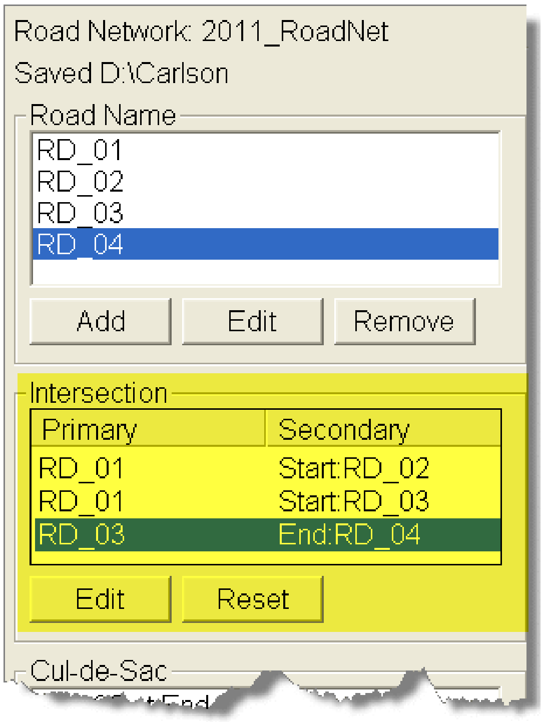
Add Knuckle Intersection

Using the steps outlined in **2 Add Roads to the Network** above, Add two more Roads to the Network.



RD_03 and RD_04

Upon adding the Roads, the new Intersections are automatically added to the **Intersection** area of the **Road Network Task Pane**.


Road Network: 2011_RoadNet
Saved D:\Carlson

Road Name
- RD_01
- RD_02
- RD_03
- RD_04

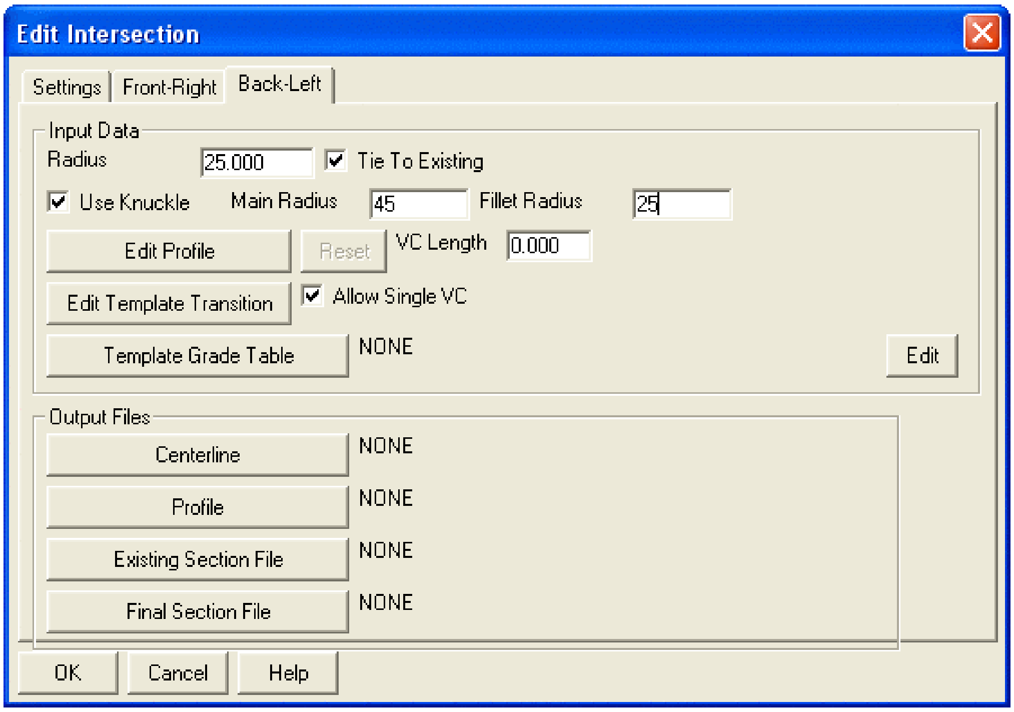
Intersection

Primary	Secondary
RD_01	Start:RD_02
RD_01	Start:RD_03
RD_03	End:RD_04

Intersection Area of the Road Network Task Pane

To create a "Knuckle" style Intersection between RD_03 and RD_04, *select the **RD_03 (Primary)/ End:RD_04***

***(Secondary)** Intersection* in the **Task Pane** and then *pick the **Edit** button* to display the**Settings** tab of the **Edit Intersection** dialog box. *Pick one of the **"Corner"** tabs* of the **Edit Intersection** dialog box. *Select the **Use Knuckle** option* and *enter a **Main Radius** and **Fillet Radius** value* for the Knuckle Intersection.



Edit Intersection
Settings
Front-Right
Back-Left
Input Data
Edit Profile
Reset
Edit Template Transition
Template Grade Table
Edit
Output Files
Centerline
Profile
Existing Section File
Final Section File
OK
Cancel
Help

Radius 25.000

☑ Tie To Existing

☑ Use Knuckle Main Radius 45 Fillet Radius 25

VC Length 0.000

☑ Allow Single VC

Template Grade Table NONE

Centerline NONE

Profile NONE

Existing Section File NONE

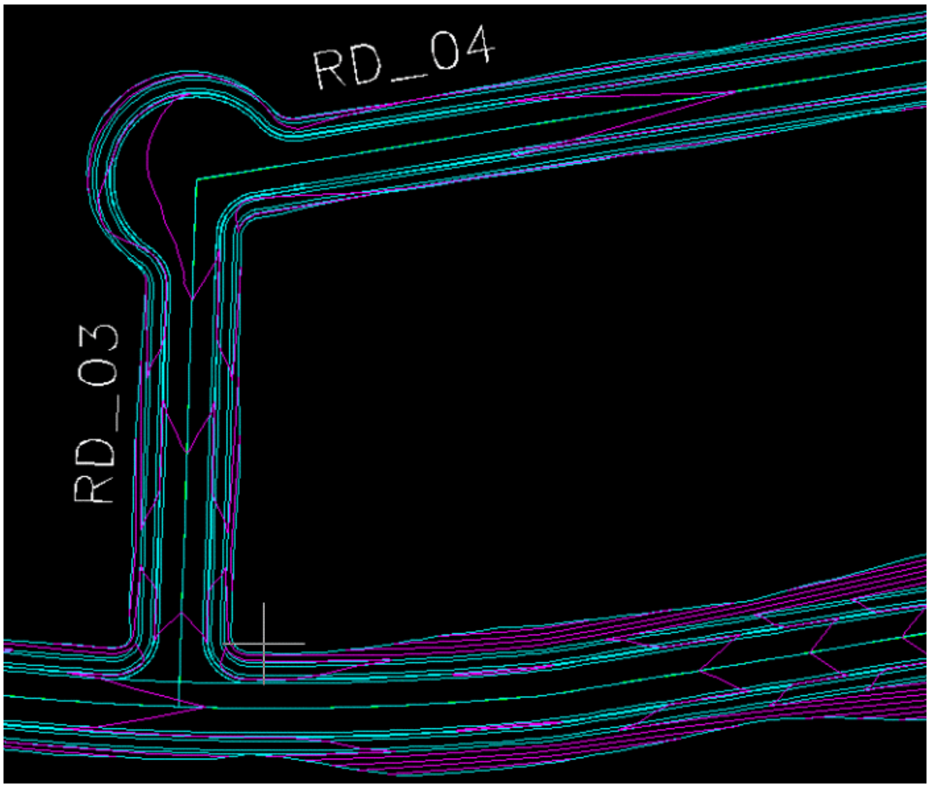
Final Section File NONE

A "Corner" Tab of the Edit Intersection Dialog Box

*Pick the **OK** button* to close **Edit Intersection**.

*Pick the **Save** button* on the **Road Network Task Pane** to **Save** the Road Network (.RDN) file.

Then, *pick the **Process** button* on the **Road Network Task Pane** to calculate the road design and perform the functions specified in **Road Network Output Options**. The resulting contours and breaklines are shown below.



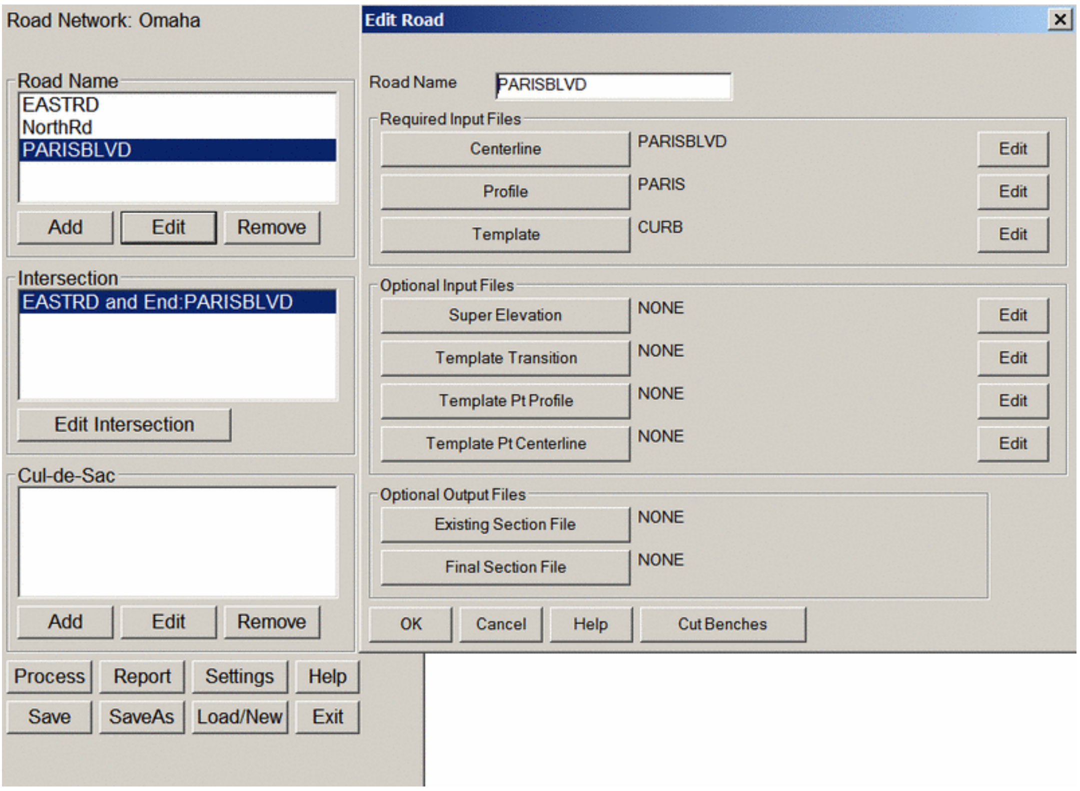
Contours and Breaklines Through a "Knuckle" Style Intersection

Step 1: Start New Road Network

Start the Road network command. If you have previously run Road Network with the current drawing, the Road Network docked dialog will open with the last Road Network (.RDN) file you worked with. If this happens, but you prefer to create a new Road Network (.RDN) file, click the Load/New button at the bottom of the Road Network docked dialog.

Step 2: Add Roads

Back in the main dialog, click "Add" in the upper left "Road Name" portion, and identify all of the main road and secondary (intersecting) road centerlines. For this example, we will start by identifying North Road and East Road as the main roads and Paris Boulevard as the first secondary road. Note that centerlines may be picked as polylines or loaded as centerline files. All centerlines (horizontal alignments) must have, at minimum, an associated profile (vertical alignment) and an associated template. In the Road name dialog portion, select a road and click Edit to review the files. Note that by selecting Paris Boulevard and East Road, the program automatically detects the first intersect. As you follow the design below, you will see that we follow the hierarchy of the road precedence as outlined in the graphics. At every intersection, there needs to be a primary controlling road (template cross slopes are held) and secondary adjusting road (centerline profile adjusts to template of primary road at some transition distance).



Road Network: Omaha

Road Name
EASTRD
NorthRd
PARISBLVD

Intersection
EASTRD and End:PARISBLVD

Cul-de-Sac

Edit Road

Road Name: PARISBLVD

Required Input Files
Centerline: PARISBLVD
Profile: PARIS
Template: CURB

Optional Input Files
Super Elevation: NONE
Template Transition: NONE
Template Pt Profile: NONE
Template Pt Centerline: NONE

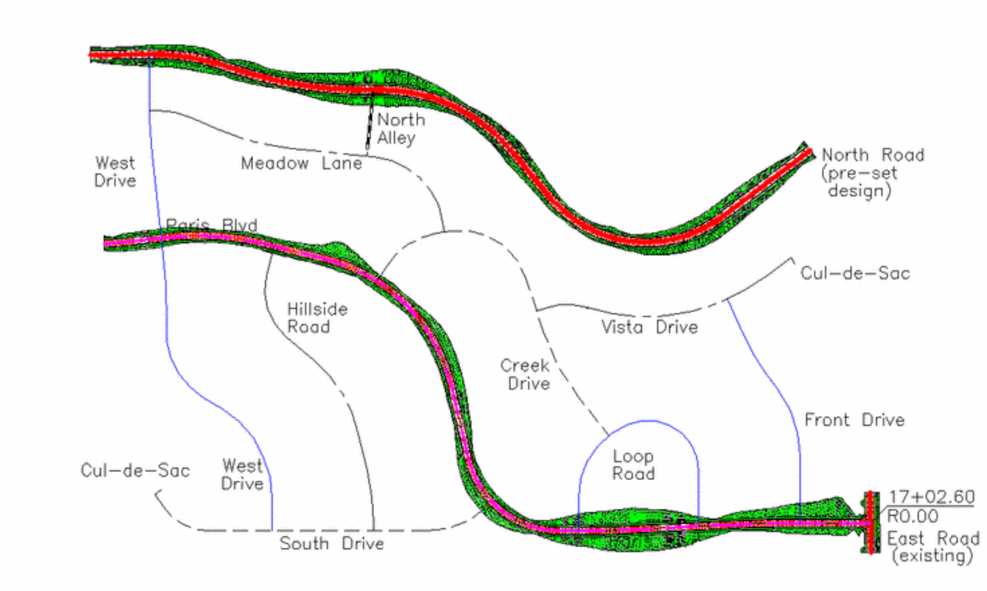
Optional Output Files
Existing Section File: NONE
Final Section File: NONE

Add
Edit
Remove
Edit Intersection
Add
Edit
Remove
Process
Report
Settings
Help
Save
SaveAs
Load/New
Exit
Edit
Edit
Edit
Edit
Edit
Edit
Edit
OK
Cancel
Help
Cut Benches

Step 3: Process, Review and Add more

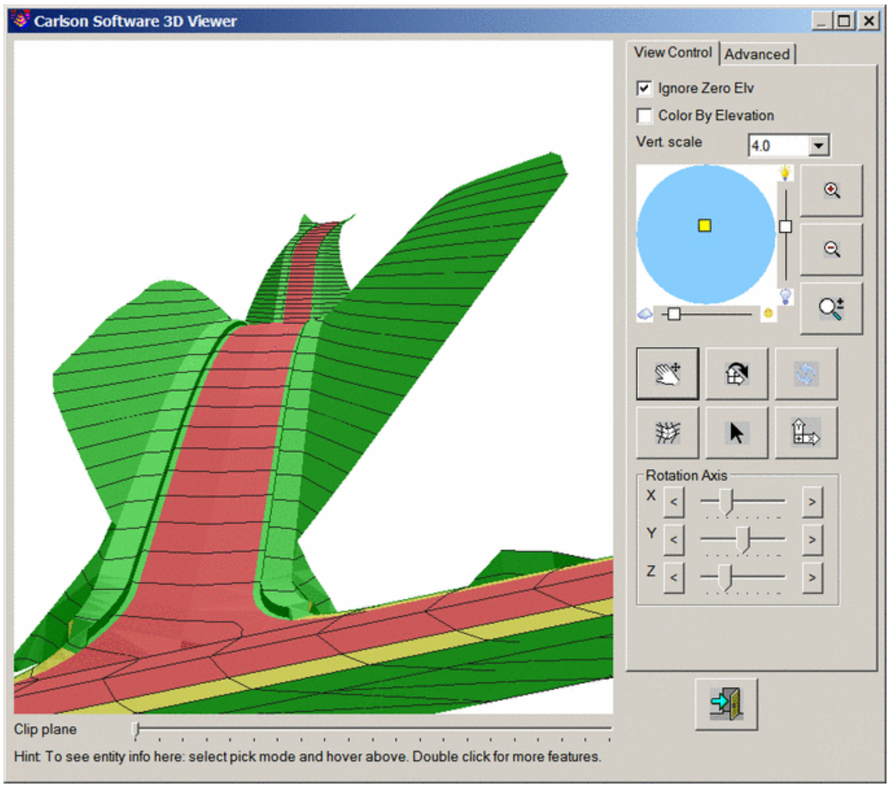
Click Process to compute the design. With the Triangulation option enabled under the "Settings" dialog, the program will Triangulate and Contour and create the drawing shown below. If you edit any road feature or dialog entry and click Process again, the program automatically clears the last Triangulate and Contour drawing and creates a new final design drawing. In this way, you can trial-and-error your design for all roads, or build the design in stages.

Viewing the file in the 3D Viewer Window comman



North
Alley
West
Drive
Meadow Lane
North Road
(pre-set
design)
Paris Blvd
Cul-de-Sac
Hillside
Road
Vista Drive
Creek
Drive
Front Drive
Loop
Road
Cul-de-Sac
West
Drive
South Drive
17+02.60
R0.00
East Road
(existing)

d with a 4.0 vertical exaggeration, you can even see how the curb-and-gutter Paris Boulevard ends abruptly as it transitions to the roadside ditch template of East Road.


Carlson Software 3D Viewer
View Control
Advanced
Rotation Axis
X
Y
Z
Clip plane

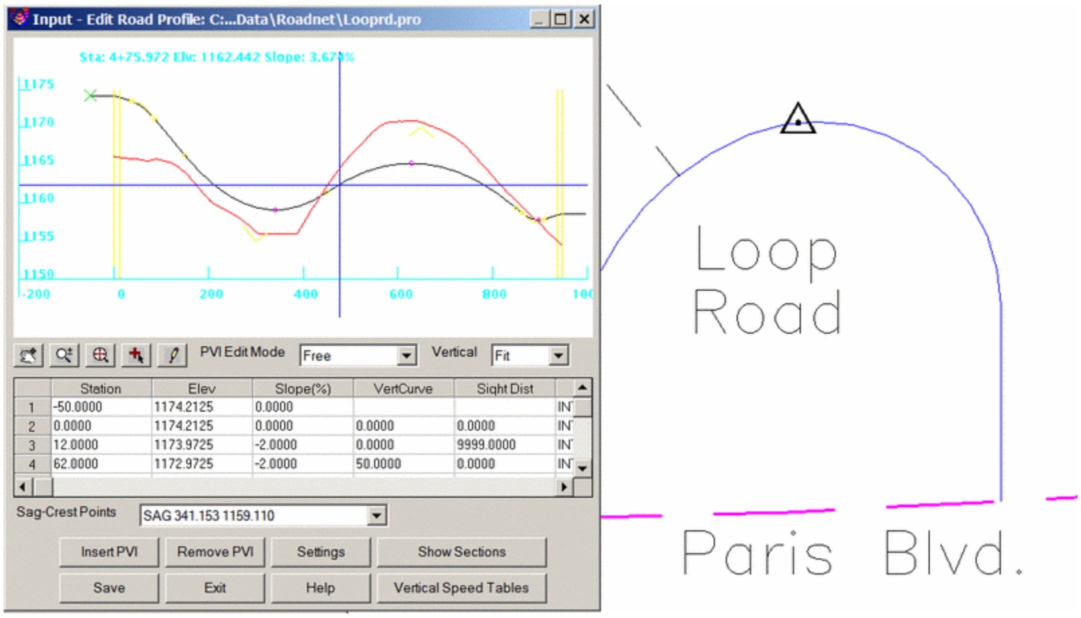
☑ Ignore Zero Elv

☐ Color By Elevation

Vert. scale 4.0

Hint: To see entity info here: select pick mode and hover above. Double click for more features.

Next we can review the effect of adding Front Drive, Loop Road and West Drive into the equation. If you click Edit after adding Loop Road as above, you have the option to change any aspect of the centerline, profile or template file, and you can add optional files such as road width change files and superelevation files. For example, if you choose to edit the profile, the program derives the existing grade from the existing surface triangulation file specified in Settings, and you are able to design graphically and interactively as shown:


Input - Edit Road Profile: C:...Data\Roadnet\Looprd.pro
1175
1170
1165
1160
1155
1150
-200
0
200
400
600
800
100
Insert PVI
Remove PVI
Settings
Show Sections
Save
Exit
Help
Vertical Speed Tables
Loop Road
Paris Blvd.

Sta: 4+75.972 Elv: 1162.442 Slope: 3.674%

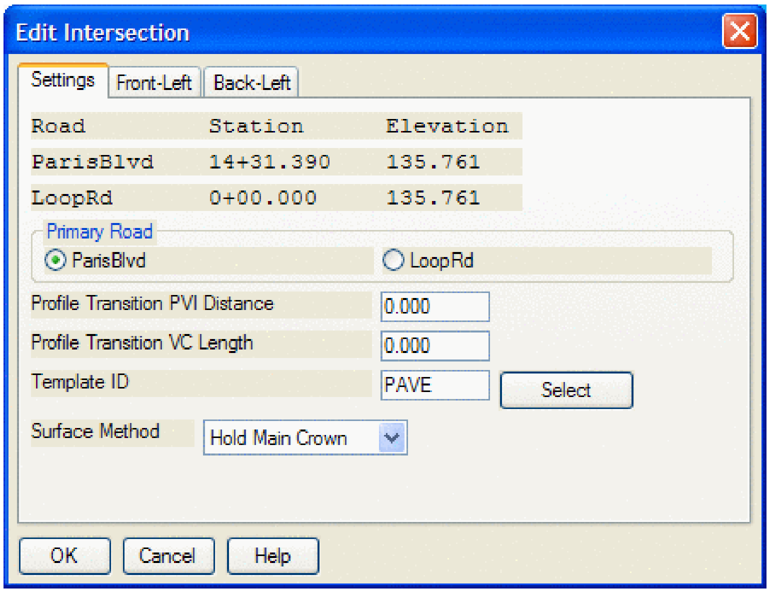
PVI Edit Mode: Free

Vertical: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist	
1	-50.0000	1174.2125	0.0000			IN
2	0.0000	1174.2125	0.0000	0.0000	0.0000	IN
3	12.0000	1173.9725	-2.0000	0.0000	9999.0000	IN
4	62.0000	1172.9725	-2.0000	50.0000	0.0000	IN

Sag-Crest Points: SAG 341.153 1159.110

You can also more closely analyze the intersections of any road. If you select the intersection at ParisBlvd and Start:LoopRd, you obtain the multi-tab dialog:


Edit Intersection
Settings
Front-Left
Back-Left
Select
OK
Cancel
Help

Road	Station	Elevation
ParisBlvd	14+31.390	135.761
LoopRd	0+00.000	135.761

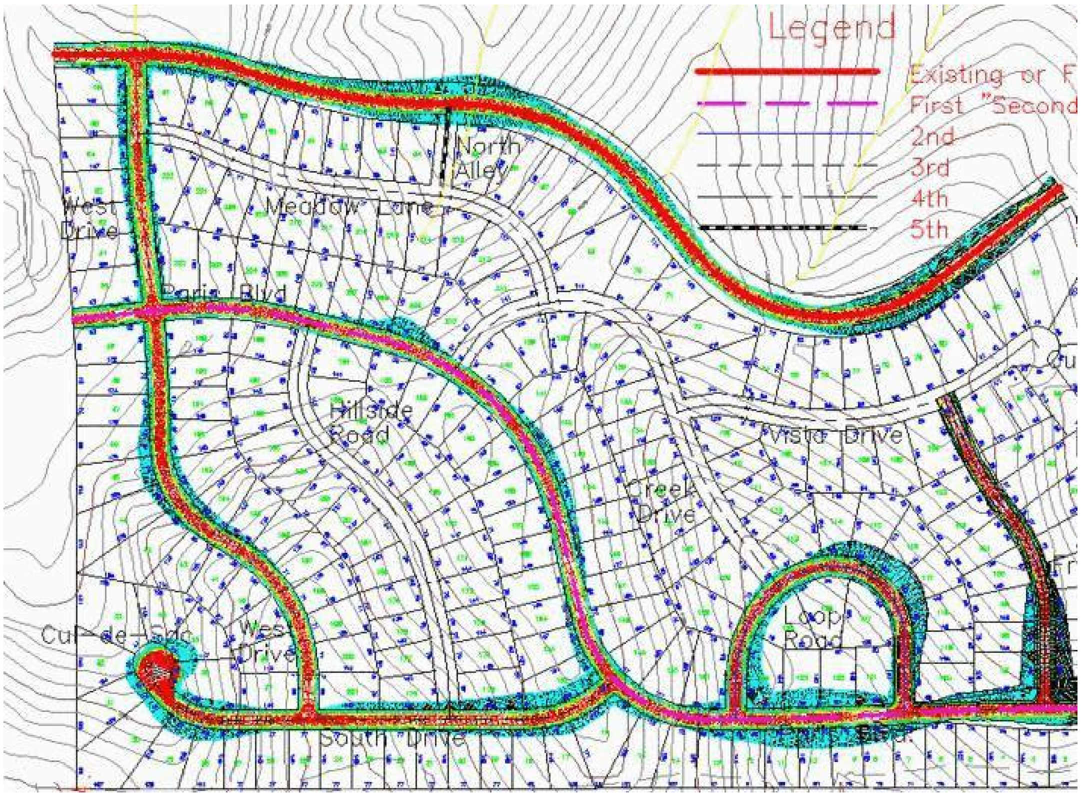
Primary Road
● ParisBlvd ○ LoopRd

Profile Transition PVI Distance: 0.000
Profile Transition VC Length: 0.000
Template ID: PAVE
Surface Method: Hold Main Crown

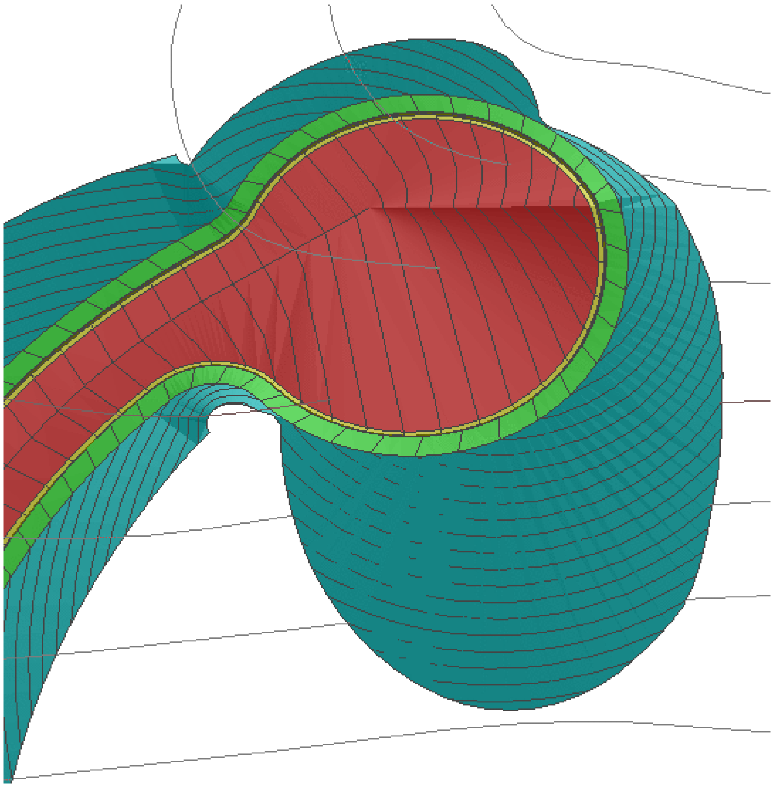
Since we do not have a crossing intersection, we only obtain a "Front-Left" tab and a "Back-Left" tab, left being the left side of the primary road (Paris) and front being the first "curve return" treatment on the outside of the loop and back being the second "curve return" treatment on the inside of the loop. If this was a crossing intersection, you would have 2 more tabs in the dialog: "Front-Right" and "Back-Right".

Completing West Drive, Front Drive and South Drive leads to the following plan view and 3D view. Clicking Add within the Cul-de-Sac portion of the docked dialog enables you to specify at cul-de-sac at the end of South Drive.

Clicking Process now produces the following:

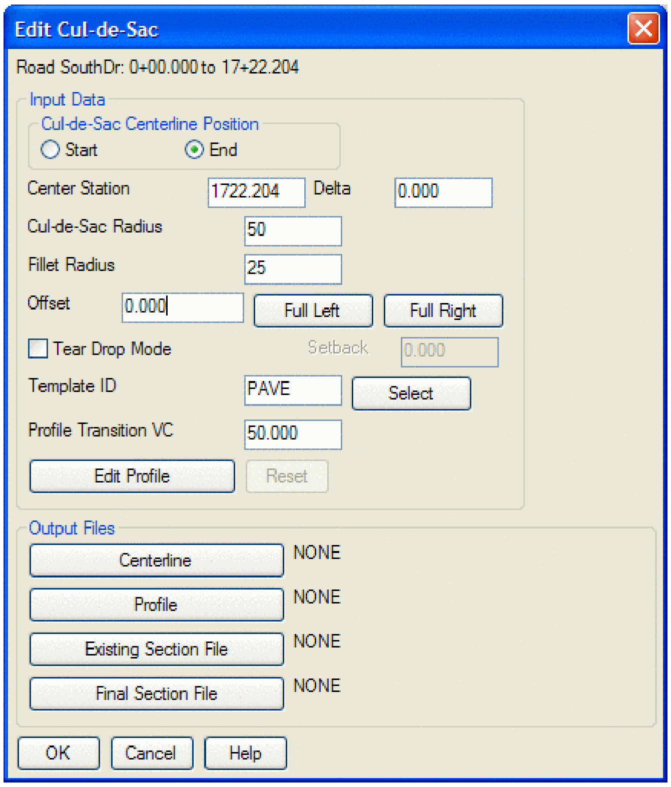

Legend
Existing or F
First "Second
2nd
3rd
4th
5th
North Alley
West Drive
Meadow Lane
Paris Blvd
Hillside Road
Vista Drive
Creek Drive
Loop Road
Cul-de-Sac
West Drive
South Drive
Cu
Fr

A close-up view of the cul-de-sac, in 3D, reveals the detail of the design, showing a raised "fold" due to no vertical curve transition at the projected high point at the back of the cul-de-sac:



This dimple effect can easily be eliminated by lowering the elevation of the "PVI" at the projected intersect point in the back of the cul-de-sac, and by adding a vertical curve transition of, say 50'. This is done by highlighting the South Drive Cul-de-Sac and clicking Edit.

Clicking Edit on the selected SouthDr at End cul-de-sac leads to this dialog:



Edit Cul-de-Sac

Road SouthDr: 0+00.000 to 17+22.204

Input Data

Cul-de-Sac Centerline Position

○ Start ● End

Center Station 1722.204 Delta 0.000

Cul-de-Sac Radius 50

Fillet Radius 25

Offset 0.000

☐ Tear Drop Mode

Setback 0.000

Template ID PAVE

Profile Transition VC 50.000

Output Files

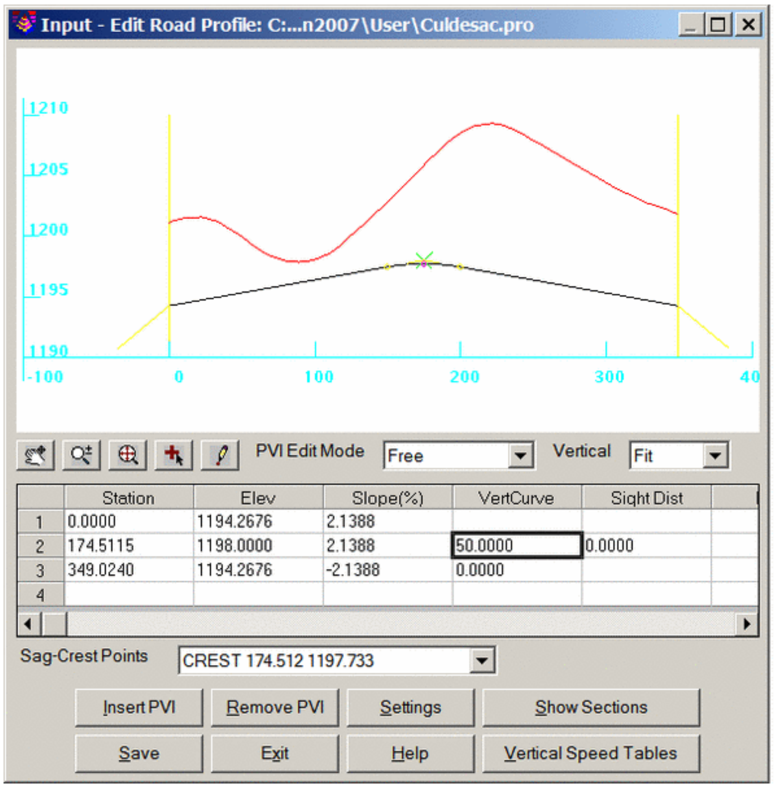
Centerline NONE

Profile NONE

Existing Section File NONE

Final Section File NONE

The first thing we do is change the Profile Transition VC from 0.0 to 50.0, as shown. Then we need to click Edit Profile to lower the profile at the back of the cul-de-sac. This profile refers to the edge-of-pavement grade.


Input - Edit Road Profile: C:...n2007\User\Culdesac.pro
1210
1205
1200
1195
1190
-100
0
100
200
300
40
Insert PVI
Remove PVI
Settings
Show Sections
Save
Exit
Help
Vertical Speed Tables

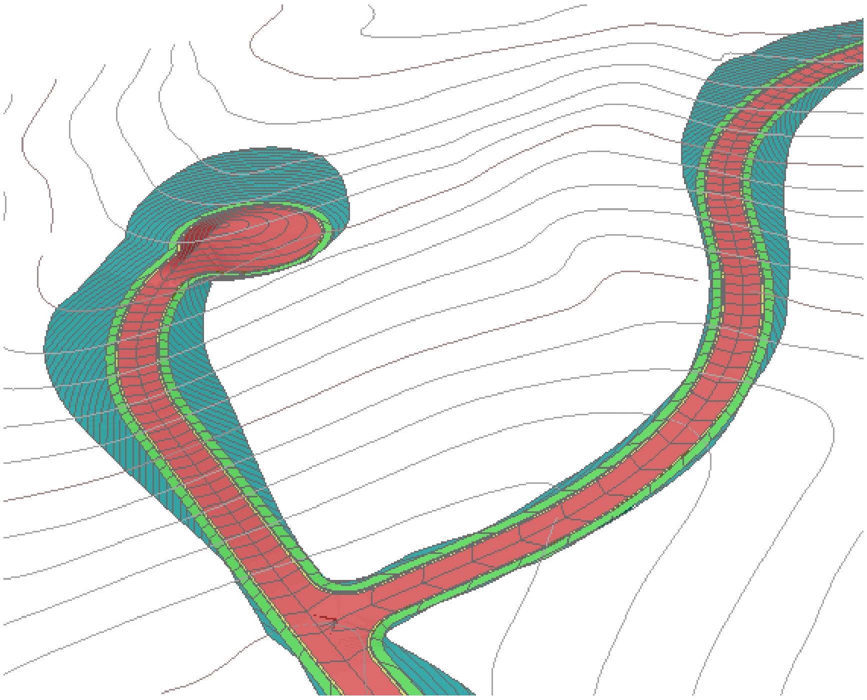
PVI Edit Mode: Free

Vertical: Fit

	Station	Elev	Slope(%)	VertCurve	Sight Dist
1	0.0000	1194.2676	2.1388		
2	174.5115	1198.0000	2.1388	50.0000	0.0000
3	349.0240	1194.2676	-2.1388	0.0000	
4					

Sag-Crest Points: CREST 174.512 1197.733

Now, after clicking Process, the cul-de-sac has a better design:



Pulldown Menu Location: Roads → Road Network
Keyboard Command: roadnet
Prerequisite: Existing Ground Surface (.TIN) file, Template (.TPL) file and 2D Centerline Polylines

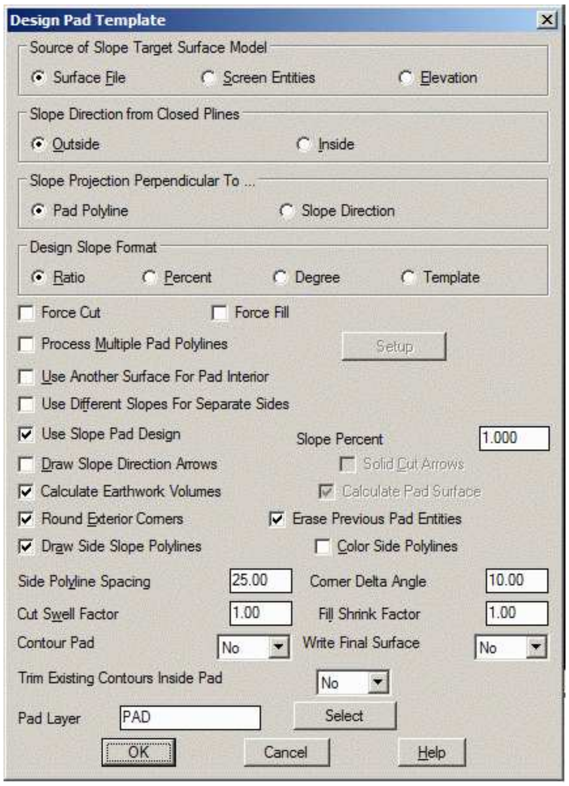
Surface Menu

13

Design Pad Template

This command creates design slopes from a perimeter polyline at specified cut/fill slopes to reach existing ground. This routine can be used to design building pads, pits, roads, ditches, stockpiles, etc. The design is drawn as 3D polylines for the cut/fill slopes and for the daylight perimeter where the design meets existing ground.

Before beginning this routine, you must have drawn the polyline representing the outside edge of the feature to model. The edge is drawn as a polyline which can be either a 2D or 3D closed or open polyline. For a 2D polyline, the program will prompt for an elevation for the pad perimeter. With a 3D polyline, the pad perimeter is set to the elevations of the 3D polyline. For an open polyline, the program will prompt for the side for the design. With a closed polyline, the program designs the slopes either outward or inward depending on the settings in the dialog.



Design Pad Template

Source of Slope Target Surface Model

● Surface File ○ Screen Entities ○ Elevation

Slope Direction from Closed Plines

● Outside ○ Inside

Slope Projection Perpendicular To ...

● Pad Polyline ○ Slope Direction

Design Slope Format

● Ratio ○ Percent ○ Degree ○ Template

☐ Force Cut ☐ Force Fill

☐ Process Multiple Pad Polylines

☐ Use Another Surface For Pad Interior

☐ Use Different Slopes For Separate Sides

☑ Use Slope Pad Design

Slope Percent: 1.000

☐ Draw Slope Direction Arrows

☐ Solid Cut Arrows

☑ Calculate Earthwork Volumes

☑ Calculate Pad Surface

☑ Round Exterior Corners

☑ Erase Previous Pad Entities

☑ Draw Side Slope Polylines

☐ Color Side Polylines

Side Polyline Spacing: 25.00

Corner Delta Angle: 10.00

Cut Swell Factor: 1.00

Fill Shrink Factor: 1.00

Contour Pad: No

Write Final Surface: No

Trim Existing Contours Inside Pad: No

Pad Layer: PAD

Under **Source of Slope Target Surface Model**, choose between a Surface File (.GRD, .FLT, .TIN), Screen Entities, or a specific Elevation. If using Screen Entities, the routine internally calculates a gridded model, the limits of which are specified by screen picks. Make sure that the grid area covers the entire area for the pad including room for the cut/fill slopes.

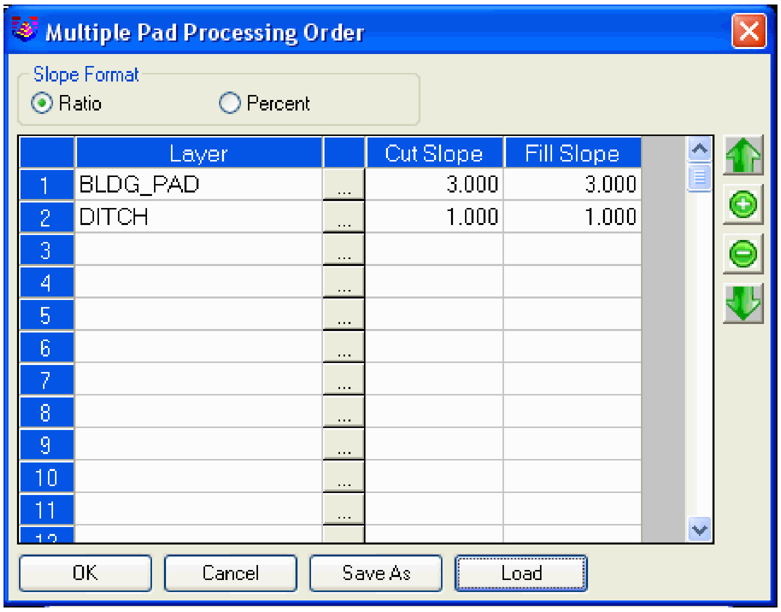
For closed pad perimeters, there is a **Slope Direction from Closed Plines** option to draw the slopes inward or outward from the perimeter. The outward method starts the slopes at the design elevation of the perimeter and projects out to intersect the existing surface. The inward method projects the slopes inside to reach the grid surface or a set elevation. Outward sloping would be used for such things as building pads, parking lots, etc. where the interior remains as a defined surface. Inward sloping would be used for such things as the top edge of an excavated pit or pond where the interior side slopes project downward at the specified slopes until reaching the original ground surface.

The **Slope Projection Perpendicular To** option applies to sloping pad perimeters. The Pad Polyline method creates the user-specified slope perpendicular to the pad perimeter. The Slope Direction method accounts for the slope of the pad perimeter and makes the final surface to match the user-specified slope. For example, if the pad perimeter is at a 10% slope and the fill slope is at 2:1, then the Pad Polyline method would create fill slopes that are 2:1 perpendicular to the pad while slightly steeper (1.96:1) for the actual slope that goes in the slope direction with the effect of the sloping pad perimeter. For the same case except with the Slope Direction method, the resulting slope perpendicular to the pad is less steep (2.04:1) while the actual slope in the slope direction is exactly 2:1.

Under **Design Slope Format**, choose between *Ratio*, *Percent*, *Degree* or *Template*. The use of a Template allows for complex slopes to be applied, and is also an alternative approach to road design. The template (.TPL) file is created in the *Design Template* routine in the Roads menu. When using a template, the pad perimeter represents the centerline. One way to create the pad perimeter for the template is to use the *Profile to 3D Polyline* command which converts a 2D centerline to a 3D polyline using a design profile. With a template, the program uses not only the cut and fill slopes from the template file but also draws all the template grade points such as edge of road, curb and ditch. The subgrade, superelevation and template transition options of the template file are not used in this command. These options are only applied in the *Process Road Design* command. The grade points are drawn as 3D polylines parallel with the centerline. Cross section 3D polylines that include the grade points are also drawn at the specified interval.

The **Force Cut** option will try the cut slope to find a catch point even when the pad perimeter starts out in fill. This is possible when the existing ground is rising faster than the cut slope. Likewise the **Force Fill** option will try the fill slope to find a catch point when the pad starts out in cut.

The **Process Multiple Pad Polylines** option allows you to process multiple pad perimeter polylines at a time instead of a single pad perimeter. The program will prompt for a selection set of pad perimeter polylines and then cycle through and run the design on each one. There will be one final report for the earthworks for all the pads. The Setup function allows you to specify different cut/fill slopes by layer and also to set the processing order by layer. For example, in the case of processing both building pads with a shallow slope and ditch polylines at a steeper slope, you could set up the processing order to do the building pad first and the ditch last so that the ditch cut slopes will carve out any overlap with the building fill slopes. These pad layer slope and order assignments can be saved and loaded from a .PAD file.

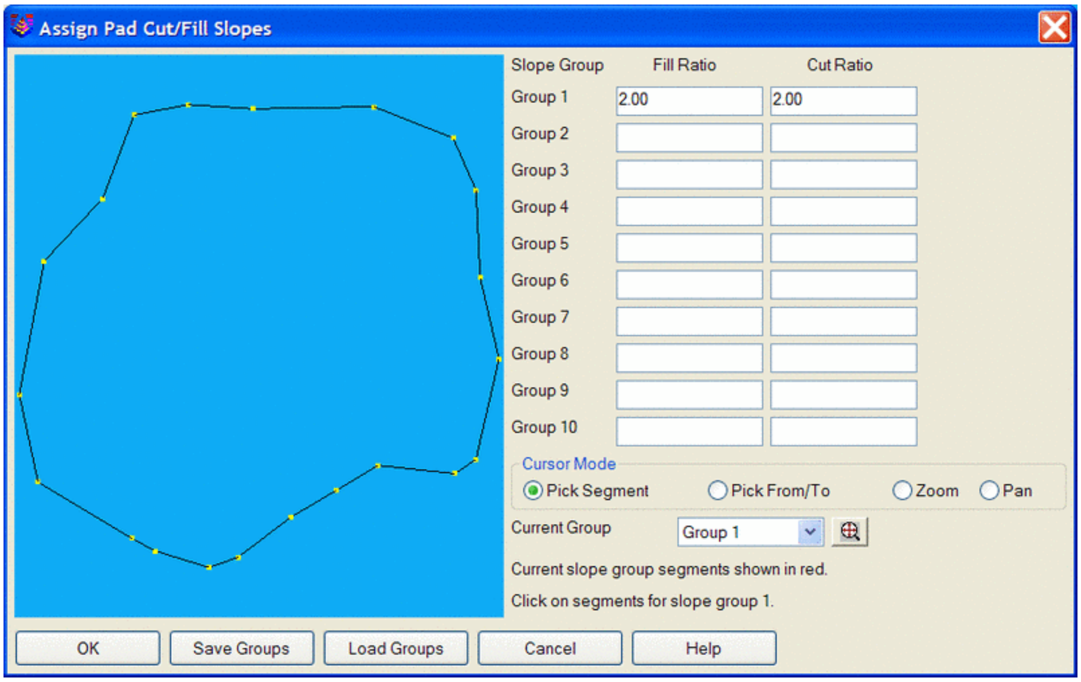

Multiple Pad Processing Order

Slope Format
● Ratio ○ Percent

	Layer		Cut Slope	Fill Slope
1	BLDG_PAD	...	3.000	3.000
2	DITCH	...	1.000	1.000
3		...		
4		...		
5		...		
6		...		
7		...		
8		...		
9		...		
10		...		
11		...		

Use Another Surface for Pad Interior will bring up a prompt for another Surface file (.GRD, .FLT, .TIN) to use for the design surface within the starting pad perimeter. Otherwise the program will model the pad interior by straight interpolation from the starting pad perimeter elevations. For example, if a building pad has a starting pad perimeter at a set elevation and the pad is supposed to be flat, then this option is not needed. This option is needed in a case where you are designing a pit and the starting pad perimeter is a 3D polyline that follows an undulating pit bottom surface. The pad design will model the pit side slopes. In order to model the undulating bottom of the pit, you need the Use Another Surface for Pad Interior option to select a surface that models the pit bottom.

Use Different Slopes for Separate Sides allows you to specify different slopes for different sides of your pad polyline. If this is toggled ON, the Assign Pad Cut/Fill Slopes dialog is invoked, where you can create multiple Slope Groups along the Pad Template polyline and set the Cut and Fill design ratios for each.



Slope Group	Fill Ratio	Cut Ratio
Group 1	2.00	2.00
Group 2		
Group 3		
Group 4		
Group 5		
Group 6		
Group 7		
Group 8		
Group 9		
Group 10		

Cursor Mode

● Pick Segment ○ Pick From/To ○ Zoom ○ Pan

Current Group: Group 1

Current slope group segments shown in red.

Click on segments for slope group 1.

Use Slope Pad Design allows you to set a cross slope amount for the top of the pad. You will be prompted to screen pick two points that designate the slope direction. For automatic balancing of cut/fill quantities, you will be prompted to find the optimal slope and slope direction.

Draw Slope Direction Arrows draws an arrow on the outslopes that points in the downhill direction. Arrows on fill slopes are drawn as solid filled.

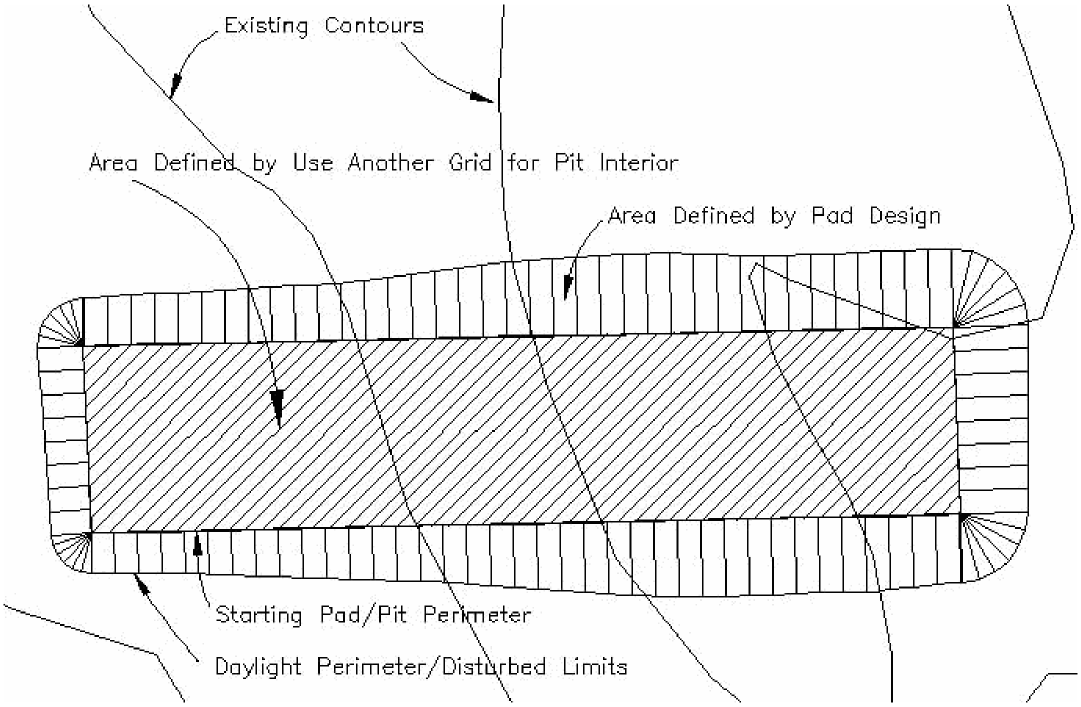
Solid Cut Arrows allows you to choose between drawing the cut arrows as solid filled or as wire frame.

Round Exterior Corners holds the outslopes around the corners. Otherwise the side outslopes stay straight until they meet at the corners as shown in the figure.

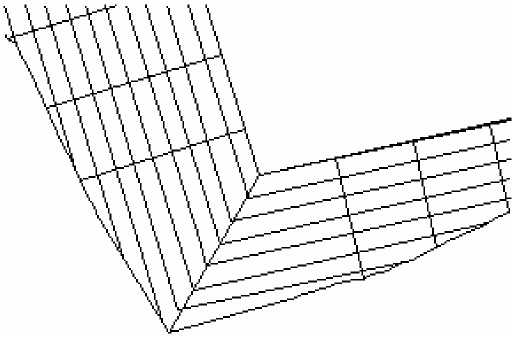
Erase Previous Pad Entities erases drawing geometry created with this command previously.

When **Draw Side Slope Polylines** is ON, Design Pad Template will draw 3D polylines perpendicular to the pad perimeter from the pad to the catch point.

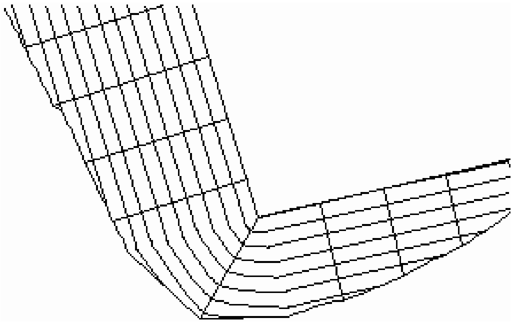
Color Side Polylines assigns different colors to Cut and Fill Side Polylines to make them easier to distinguish.


Existing Contours
Area Defined by Use Another Grid for Pit Interior
Area Defined by Pad Design
Starting Pad/Pit Perimeter
Daylight Perimeter/Disturbed Limits

Example of pit design for option of Use Another Grid for Pad Interior



Pad corner without round corners option



Pad corner with round corners option

Side Polyline Spacing specifies the interval at which to draw the Side Slope Polylines. Besides at the interval, side slope polylines are also drawn at grid corners.

Corner Delta Angle is the delta angle in degrees between side slope polylines to span the delta angle around exterior corners.

Cut volume is multiplied by the **Cut Swell Factor** in the final volume report.

Fill volume is multiplied by the **Fill Shrink Factor** in the final volume report.

The **Contour Pad** option draws contours on the pad. At the end routine, a dialog lets you set the contouring options. Usually you should specify a new contour layer and turn off smoothing.

The **Write Final Surface** option creates a surface model of the pad using the elevations of the pad within the disturbed area polyline and using the original ground surface everywhere else. At the end of the routine, the program will prompt for the surface file name to create.

The **Trim Existing Contours Inside Pad** option trims existing contours inside the disturbed limits of the pad.

You must specify the **Pad Layer Name** that the pad 3D polylines will be drawn on.

There is an option to calculate volumes for the pad design. The volumes are calculated by comparing the existing surface with the pad design. The inclusion perimeter for the volume calculation is the daylight perimeter polyline which represents the limits of disturbed area. The existing surface model is defined by the existing surface file (.GRD, .FLT, .TIN) or screen entities selected at the beginning of the command. The pad design surface is calculated by making a surface from the pad 3D polylines including the starting pad perimeter, the side polylines and the daylight perimeter.

Besides calculating the volumes in the *Design Pad Template* routine, you can also calculate the volumes with the *Two Surface Volumes* command, or the *Volumes by Triangulation* command. Two Surface Volumes works with two grid files, Volumes by Triangulation works with two TIN files. The design surface for Two Surface Volumes can be the final output surface from Design Pad or you can create a design surface with *Make 3D Grid File* using the 3D polylines created in *Design Pad*. You could also create a TIN surface of the design surface using *Triangulate and Contour*. Some of the reasons to use either the Two Surface Volumes command or the Volumes by Triangulation command are that these volume routines have more output options (cut/fill color maps, etc.) and you can check the volumes by plotting or contouring the surface files. Also, you can combine several pads and other final surfaces by running *Make 3D Grid File* or *Triangulate and Contour* and then use these volume commands to calculate the overall site volumes.

The design is drawn as 3D polylines and the earthwork volumes are calculated. Before ending, the program allows you to adjust the design by changing the pad elevation, slopes and offset. The program can find the cut/fill balance by automatically adjusting the pad elevation. If adjustments are specified, the pad polylines are redrawn and the volumes recalculated.

A few Key things to note:

1. If the Source of Slope Target Surface Model is set to a Surface File, and the surface file used is a grid file, then the surface produced from the designed pad will be a grid surface and a grid file (.GRD).
2. If the Source of Slope Target Surface Model is set to a Surface File, and the surface file used is a TIN file, then the surface produced from the designed pad will be a triangulated surface and a TIN file (.TIN).
3. If the Surface used as a Target Surface is listed in the Surface Manager, the prompt seen in the Design Pad Template command is whether or not to Update the Surface, which is the Target Surface, so if you say "Yes," your Existing Ground Surface will now essentially contain the designed pad. So if you want to maintain an unedited version of Existing Ground, you may want to start with a copy of the Existing Ground Surface.
4. If the Surface used as a Target Surface is not listed in the Surface Manager, the prompt seen in the *Design Pad Template* command is whether or not to create a new surface of the combined surfaces.
5. If you respond "Yes" to the prompt about whether to contour the designed pad, the contouring dialog box has an option of whether to write the designed pad as a new surface, which will be only the area within the limits of the new design, not the entire Target Surface and design pad surface combined.

Prompts

First you are presented with the Design Pad Template dialog box.

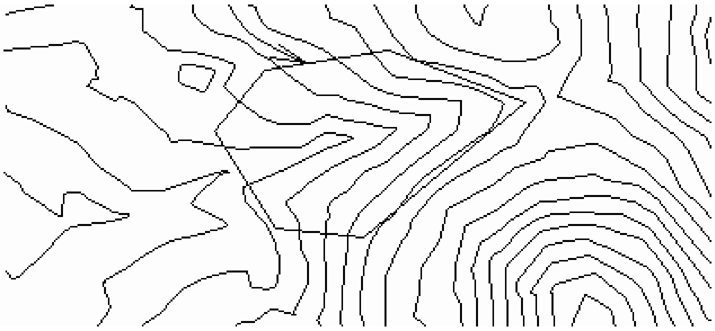
If the Source of Slope Target Surface Model is set to a Surface File, you will first be asked to:
Pick the top of pad polyline: *select perimeter polyline*
Then the Select Slope Target Surface dialog box is presented. Choose the Slope Target Surface file, pick Open. You then proceed to enter the slope parameters of the pad...

If the Source of Slope Target Surface Model is set to a Screen Entities, you will first be asked to:

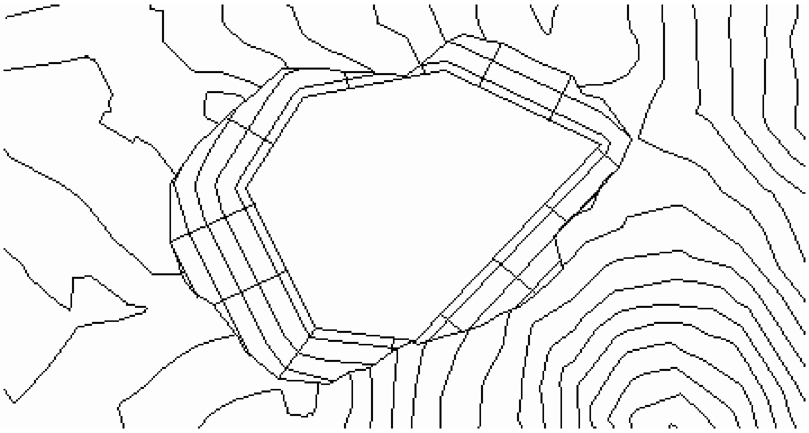
Pick Lower Left limit of pad disturbed area: *pick lower left* These prompts appear for the Screen Entities surface model method.
Pick Upper Right limit of pad disturbed area: *pick upper right* Be sure to pick these limits well beyond the area of the top of pad polyline in order to make room for the outslopes.
Make Grid File Dialog After selecting the limits of the disturbed area the program will generate a 3D grid that represents the surface. Specify the grid resolution desired and select OK.

Then,
Pick the top of pad polyline: *select perimeter polyline*
Then proceed to enter the slope parameters of the pad...

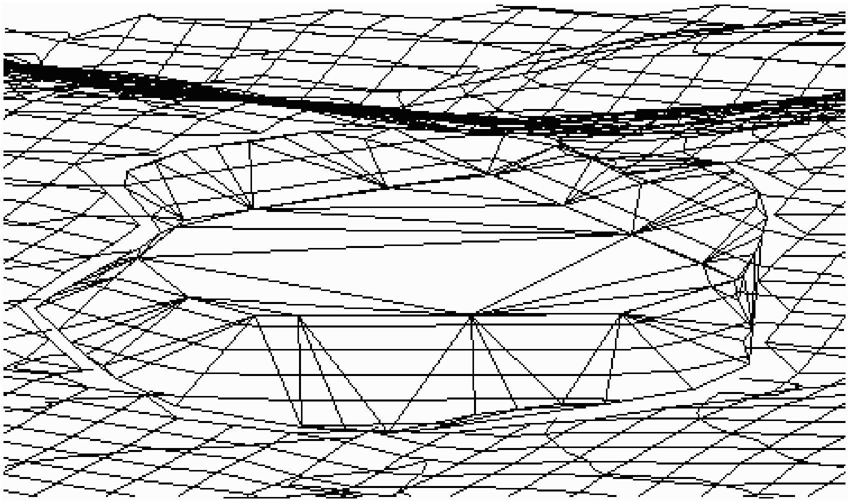
Enter the fill outslope ratio <2.0>: *2.5*
Enter the cut outslope ratio <2.0>: *2.5* After entering outslopes slope ratios, a range of elevations along the pad top will be noted.
Enter the pad elevation <29.54>: *39*
Calculate earthwork volumes (<Yes>/No)? *press Enter*
Report Viewer Reports cut/fill volume.
Adjust parameters and redesign pond (Yes/<No>)? *press Enter*
Write final surface to grid file (Yes/<No>)? *press Enter*
Trim existing contours inside pad perimeter (Yes/<No>)? *press Enter*
Contour the pad (<Yes>/No)? *press Enter*



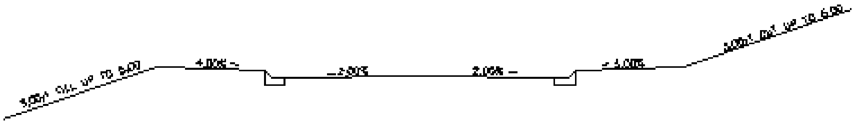
Existing contours with top of pad perimeter polyline



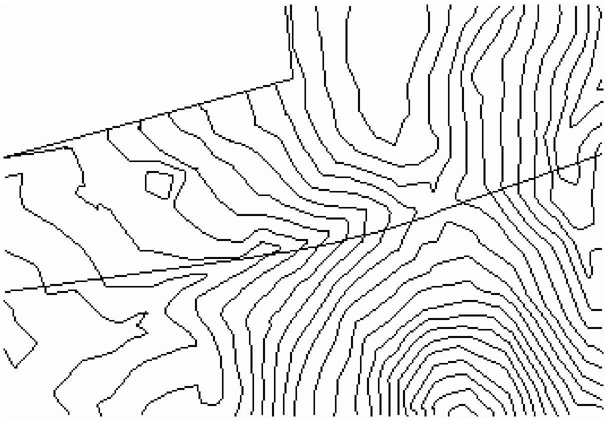
Pad template with contours



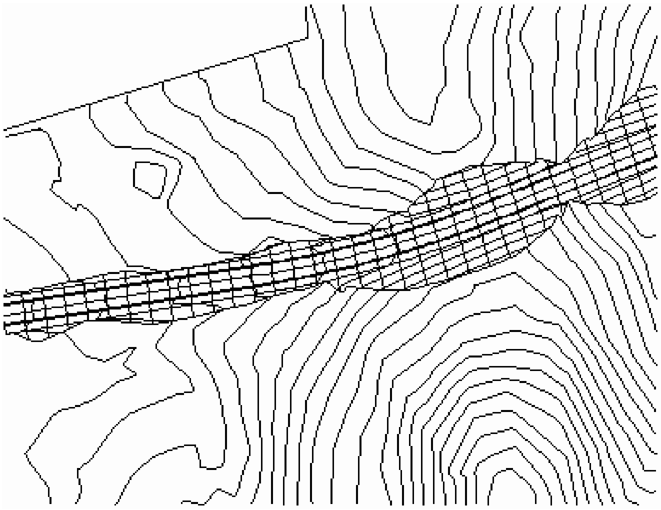
3D view of pad with DTM of surface and triangulation faces of pad


3.00:1 FILL UP TO 6.00
4.00%
2.00%
2.00%
4.00%
3.00:1 CUT UP TO 6.00

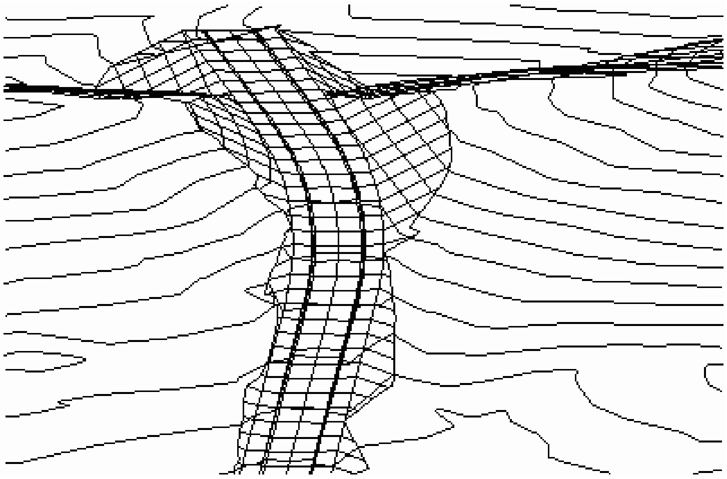
Template to apply in Design Pad Template



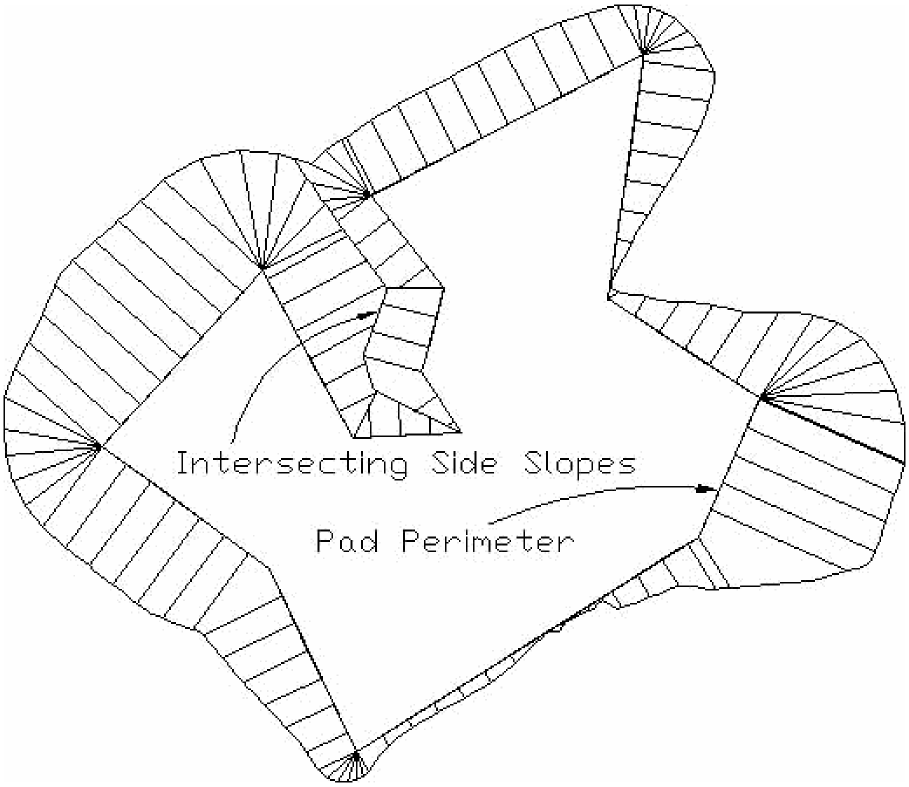
Existing surface with 3D polyline centerline



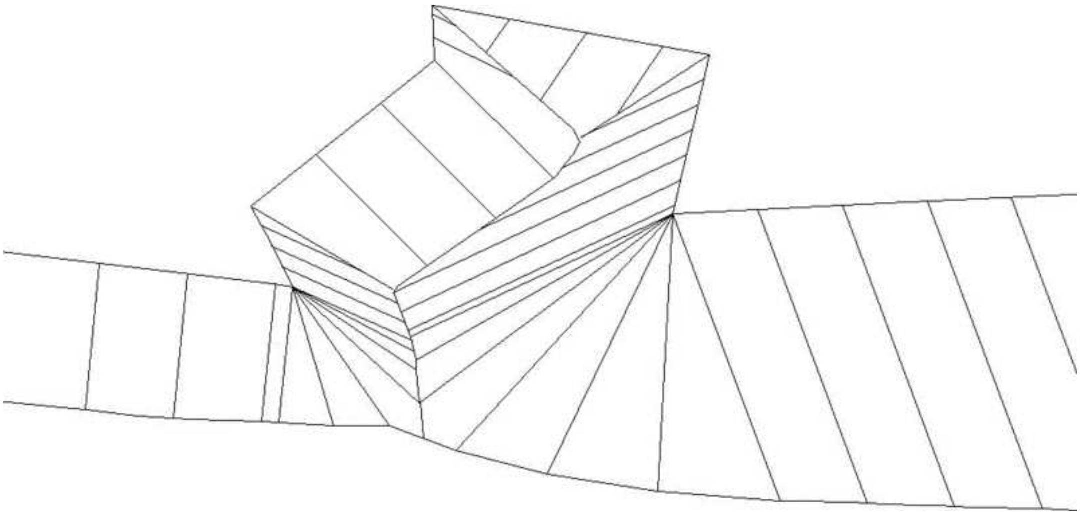
Result of Design Pad Template showing template grade polylines, cross section polylines, cut/fill slopes, and final contours



Viewpoint 3D view of Design Pad Template



Design Pad Template can also handle self-intersecting side slopes



Viewpoint 3D view of intersecting side slopes

Pulldown Menu Location: Surface
Keyboard Command: pad
Prerequisite: A pad perimeter polyline and surface entities or a surface file for an intercept target.

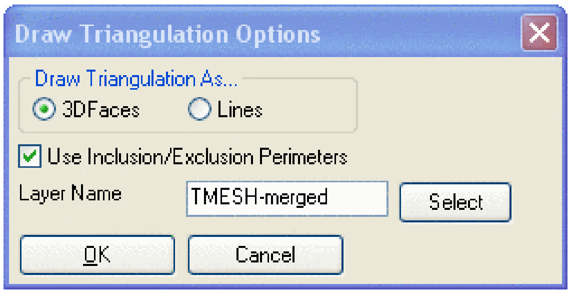
Draw Triangular Surface

This command draws a triangulation (.flt or .tin) file as either 3D LINES or 3DFACEs. Since 3DFACE entities can be shaded within the *3D Viewer Window* or *3D Surface FlyOver,* or with the AutoCAD *3D Orbit* command, this is an excellent tool for visual surface inspection. 3D Lines cannot be shaded.

Triangulation (.flt or .tin) files can be created by *Triangulate & Contour*.

Prompts

Select TMESH File to Draw
Choose a triangulation (.flt or .tin) file from the file selection dialog. You are then prompted for options:



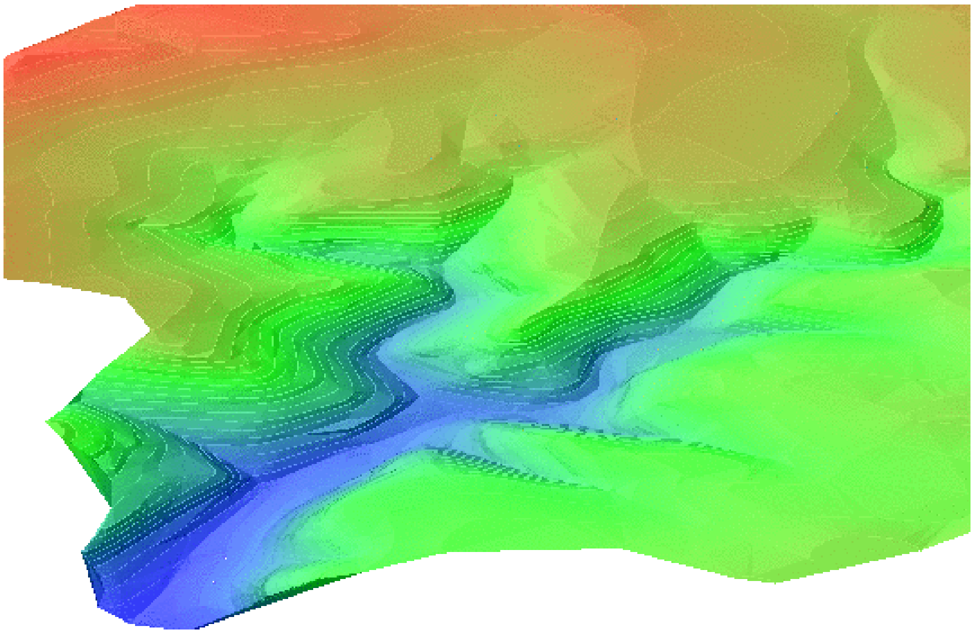
● 3DFaces ○ Lines

☑ Use Inclusion/Exclusion Perimeters

Layer Name: TMESH-merged

If using Inclusion/Exclusion Perimeters, you will be prompted to select them as the routine executes.

Loading edges...
Loaded 198 points and 234 edges

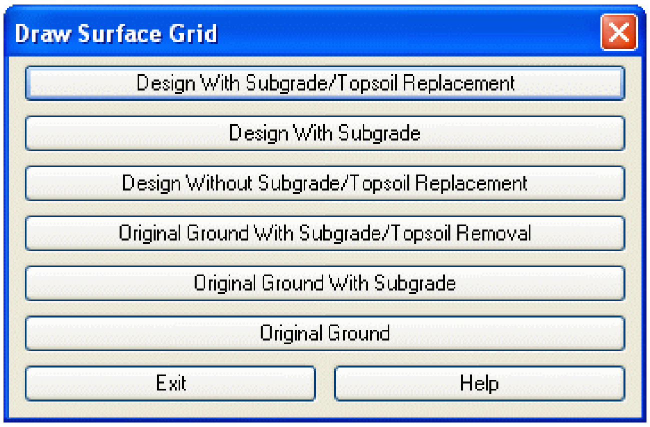


This Triangulation mesh was drawn as 3DFaces with the Draw Triangular Mesh command, and then colorized by elevation within 3D Viewer Window

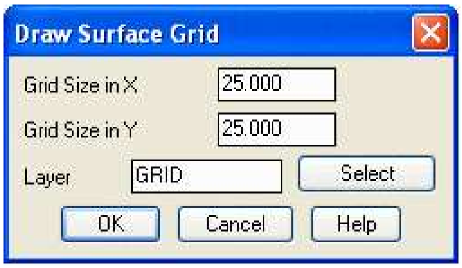
Pulldown Menu Location: Surface >> Draw Surface
Keyboard Command: drawtri
Prerequisite: A triangulation (.flt or .tin) file

Draw Surface As Grid

This command writes a grid file (.grd) from an existing triangulation file (.flt or .tin) in the current drawing.


Draw Surface Grid
Design With Subgrade/Topsoil Replacement
Design With Subgrade
Design Without Subgrade/Topsoil Replacement
Original Ground With Subgrade/Topsoil Removal
Original Ground With Subgrade
Original Ground
Exit
Help

After selecting the triangulation file to convert, you are prompted for the X, Y grid interval and the Layer name.

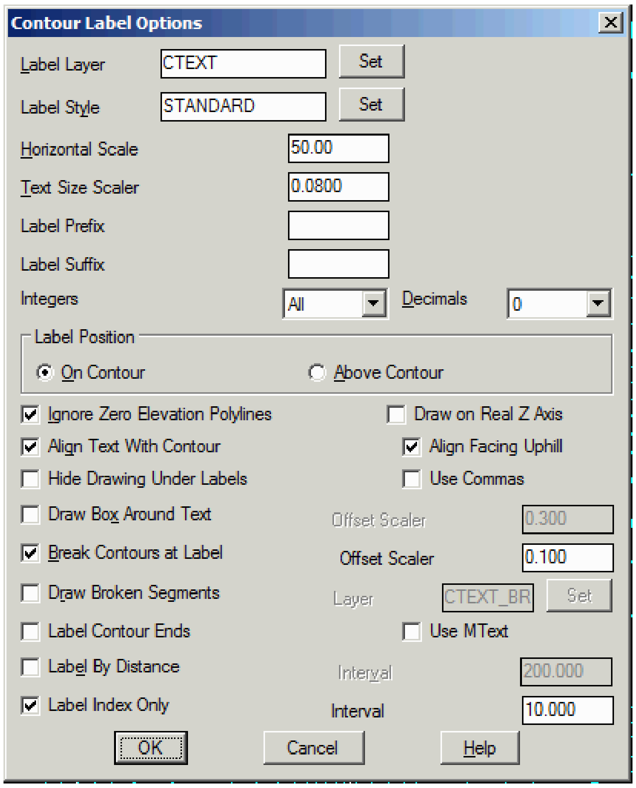

Draw Surface Grid
Select
OK
Cancel
Help

Grid Size in X 25.000
Grid Size in Y 25.000
Layer GRID

Prerequisite: a existing or design surface
Keyboard Command: draw_surface_grd

Contour Elevation Label

This command can be used to simultaneously create elevation labels on a group of contour polylines at elevation. First the command starts with a dialog with the label options. Then to place the labels, pick two points crossing the contour polylines at the desired label location. The program will find all the contour polylines that intersect the picked line (defined by the two picked points) and will place labels at the intersection point of each contour. A second crossing line can be initiated immediately, so multiple areas can be quickly labeled while remaining in the command. Alternatively, you can type P for Polyline at the Command prompt and select a polyline. Then the program finds all the intersections between the selected polyline and the contours and places labels at these intersections. The actual "z" elevation of the contour line determines the label value.



Contour Label Options

Label Layer: CTEXT [Set]

Label Style: STANDARD [Set]

Horizontal Scale: 50.00

Text Size Scaler: 0.0800

Label Prefix:

Label Suffix:

Integers: All

Decimals: 0

Label Position: ● On Contour ○ Above Contour

☑ Ignore Zero Elevation Polylines

☐ Draw on Real Z Axis

☑ Align Text With Contour

☑ Align Facing Uphill

☐ Hide Drawing Under Labels

☐ Use Commas

☐ Draw Box Around Text

Offset Scaler: 0.300

☑ Break Contours at Label

Offset Scaler: 0.100

☐ Draw Broken Segments

Layer: CTEXT_BR [Set]

☐ Label Contour Ends

☐ Use MText

☐ Label By Distance

Interval: 200.000

☑ Label Index Only

Interval: 10.000

Label Layer specifies layer name for the contour labels that will be created.
Label Style specifies the text style to be used for labels.
Horizontal Scale is used in conjunction with the Text Size Scaler to determine unit height of the contour labels.
Text Size Scaler is a scaler that will be multiplied by the horizontal scale to set the actual text height of the labels in AutoCAD units.
Integers controls how many digits to label to the left of the decimal. For example, if all contours are in the 5000's, then setting for three digits would label the 5280 contour as 280.
Decimals sets the decimal precision for the labels to be created.
Label Position determines the label position in relation to the contour polyline.

- **On Contour** centers the label on the contour line.

- **Above Contour** places the label above the contour line. If this option is used, the options for Break Contours at Label and Draw Broken Segments become inactive.

Ignore Zero Elevation Polylines enables the routine to filter out all entities with an elevation of zero.
Hide Drawing Under Labels activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour line is still fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, yet the contour lines themselves remain contiguous. This feature will also hide other entities that are in the immediate vicinity of the contour label.
Align Facing Uphill makes the label parallel to the contour and flips the label so that it reads facing uphill. Otherwise, the labels are made to face up relative to the current screen view. When this option is on, the program prompts for a triangulation surface file that should match the surface the contours represent.
Use Commas adds a comma into the labels for the thousands place such as "5,000" instead of "5000".
When **Align Text with Contour** is checked, contour elevation labels will be rotated to align with their respective contour lines.
When **Break Contours at Label** is checked, the contour lines will be broken and trimmed at the label location for label visibility.
When **Draw Broken Segments** is checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.
Label Contour Ends creates labels off the ends of the contours.

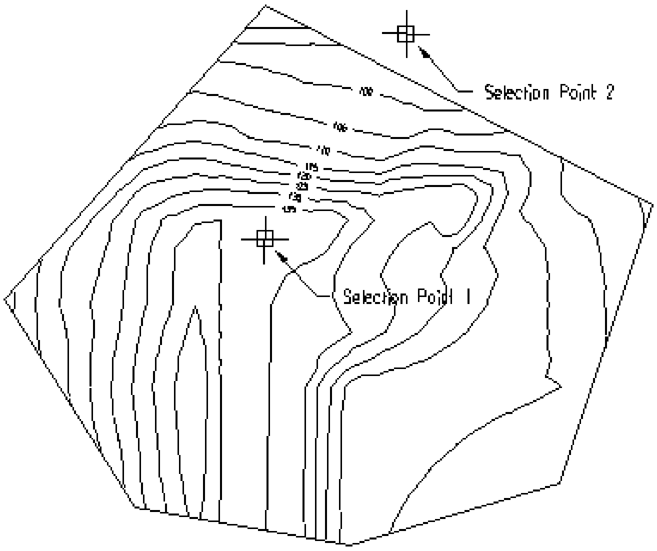
Label By Distance places the labels by distance along the contour. The user is not prompted for screen picks of contour crossing when this option is used.

- **Interval** sets the distance interval to be used between labels on each contour.

When **Draw Box Around Text** is checked, a rectangle will be drawn around the elevation labels. The Offset Scaler controls the size of the rectangle.
The **Draw On Real Z Axis** chooses between creating the text entities at the elevations of the contours or at zero elevation.
The **Use MText** chooses between creating MText and DText label entities.
Label Index Only: When checked, only Index contours are labeled.

Prompts

Contour Label Options Dialog Opens Select the desired options and press OK.
Define a line which slices the contours at the desired label locations.
Pick 1st point (P-Polyline, Enter to end): *pick a point*
Pick 2nd point: *pick a point*

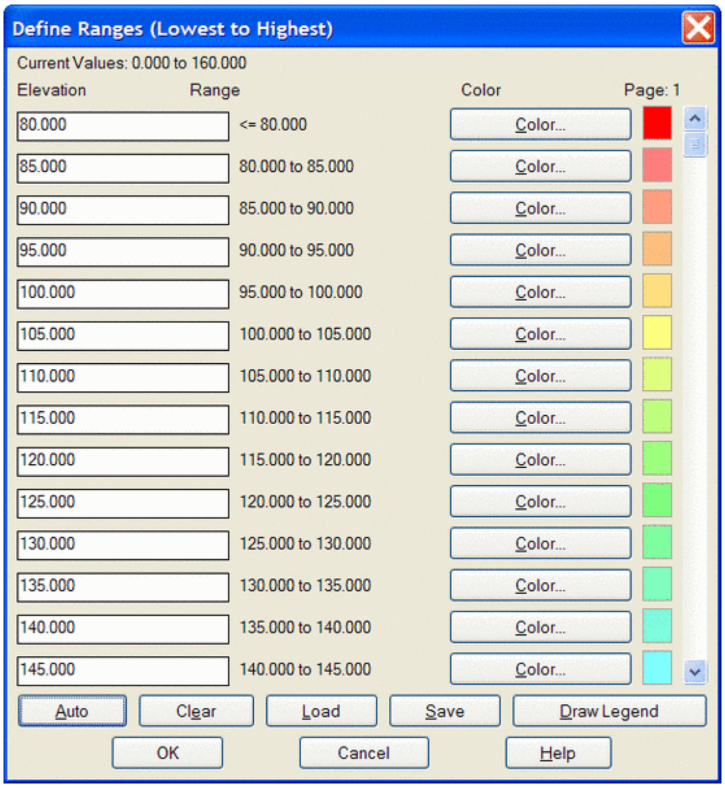


By selecting two points the contour lines that cross the line defined by the two points are labeled.

Pulldown Menu Location: Surface >> Contour Labels
Keyboard Command: gclabel
Prerequisite: polylines with elevation (contour polylines)

Color Contours by Elevation

This command sets the color of the selected contour polylines and text based on elevation. The color to use is defined in elevation range table.

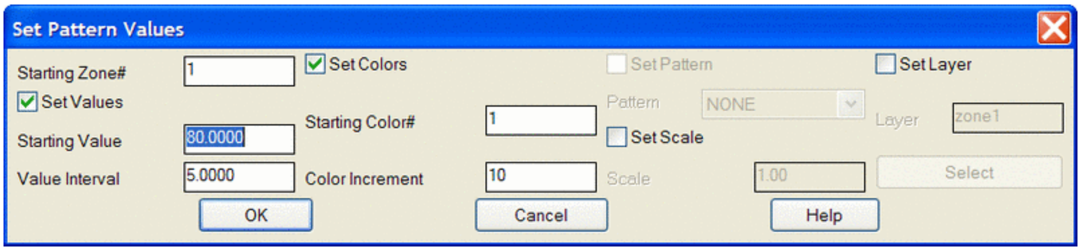


Define Ranges (Lowest to Highest)

Current Values: 0.000 to 160.000

Elevation	Range	Color	Page: 1
80.000	<= 80.000	Color...	🟥
85.000	80.000 to 85.000	Color...	🟥
90.000	85.000 to 90.000	Color...	🟧
95.000	90.000 to 95.000	Color...	🟧
100.000	95.000 to 100.000	Color...	🟨
105.000	100.000 to 105.000	Color...	🟨
110.000	105.000 to 110.000	Color...	🟨
115.000	110.000 to 115.000	Color...	🟩
120.000	115.000 to 120.000	Color...	🟩
125.000	120.000 to 125.000	Color...	🟩
130.000	125.000 to 130.000	Color...	🟩
135.000	130.000 to 135.000	Color...	🟩
140.000	135.000 to 140.000	Color...	🟦
145.000	140.000 to 145.000	Color...	🟦

- **Auto -** This button opens the following dialog, allowing for automatic configuration of the range of elevations and colors.



Set Pattern Values

Starting Zone# 1

☑ Set Values

Starting Value 80.0000

Value Interval 5.0000

☑ Set Colors

Starting Color# 1

Color Increment 10

☐ Set Pattern

Pattern NONE

☐ Set Scale

Scale 1.00

☐ Set Layer

Layer zone1

  - **Starting Zone # -** Sets the zone with which to begin the application of the settings defined in this dialog. For Instance, if the Starting Zone was set to 10, the settings definitions applied here wouldn't affect Zones 1-9, but would start at Zone 10.
  - **Set Values -** Enables the Starting Value and Value Interval fields, which allow the user to specify the starting elevation for the given zone and set the zone increment.
  - **Starting Value -** Sets the starting elevation value for the first zone.

  - **Value Interval -** Sets the elevation increment for subsequent zones.
  - **Set Colors -** Enables the Starting Color and Color Increment fields.
  - **Starting Color # -** Sets the starting color number, based on the AutoCAD standard color chart.
  - **Color Increment -** Sets the color number to increase for subsequent zones. So if the increment was set to 5, and the starting color was 60, the next color would be 65, 70, and so on.
  - **Note:** The Pattern, Scale, and Layer options do not apply to this command.

- **Clear -** Clears the all of the Elevation fields in the dialog

- **Load -** Loads previous settings from a saved .pat file
- **Save -** Saves the current setting configuration to a .pat file.

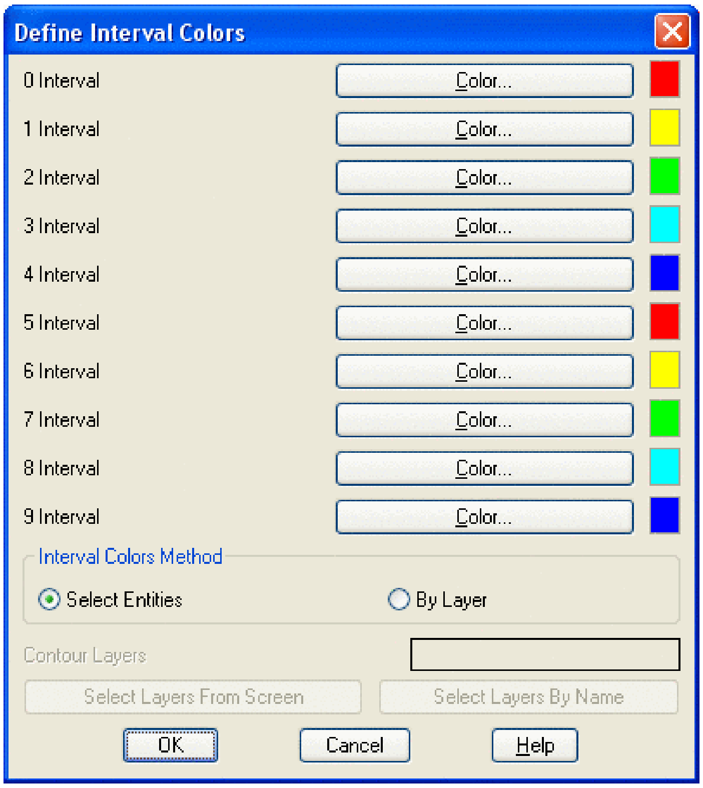
Prompts

Select polylines and text to color: *pick the entities*
Define Ranges Dialog
Pick point for color legend: *pick a point to a clear area of the drawing to place a legend or press Enter for no legend*

Pull-Down Menu Location: Surface >> Modify Contours >> Color Contours
Keyboard Command: ctrcolor
Prerequisite: Contours polylines

Color Contours by Interval

This command sets the color of the selected contour polylines based on the elevation interval values, which are essentially the number that the elevation ends with, so specific colors are assigned for elevations ending in 0, 1, 2, etc. The color assignments are defined in the Define Interval Colors dialog box.


Define Interval Colors
0 Interval
Color...
1 Interval
Color...
2 Interval
Color...
3 Interval
Color...
4 Interval
Color...
5 Interval
Color...
6 Interval
Color...
7 Interval
Color...
8 Interval
Color...
9 Interval
Color...
Interval Colors Method
Contour Layers
Select Layers From Screen
Select Layers By Name
OK
Cancel
Help

Interval Colors Method: ● Select Entities ○ By Layer

Select Entities: User is prompted to select the contour polylines to change.
By Layer: Contour polylines are selected automatically by their layer.

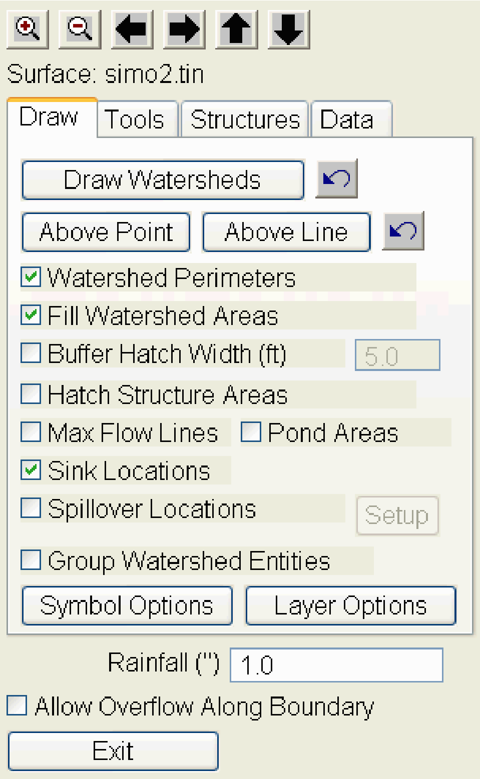
Prompts

Define Interval Colors Dialog If Select Entities is set as Interval Colors Method, *pick OK*, and you are prompted to:
Select polylines and text to color: *pick the entities* If By Layer is set as Interval Colors Method, set the *layers by Screen* selection or *from a list by Name*, then *pick OK*.

Pull-Down Menu Location: Surface >> Modify Contours >> Color Contours
Keyboard Command: ctrcolor2
Prerequisite: Contours polylines

Watershed Analysis

This command has a collection of tools to analyze the runoff of a surface defined by a triangulation or grid surface file. After selecting the surface file of the surface, the program docks a dialog on the left side of the drawing window. While the Watershed Analysis dialog is running, other AutoCAD and Carlson commands are not available. To zoom or pan the drawing view, use the buttons at the top of the dialog, or use the middle button of a wheel-mouse.

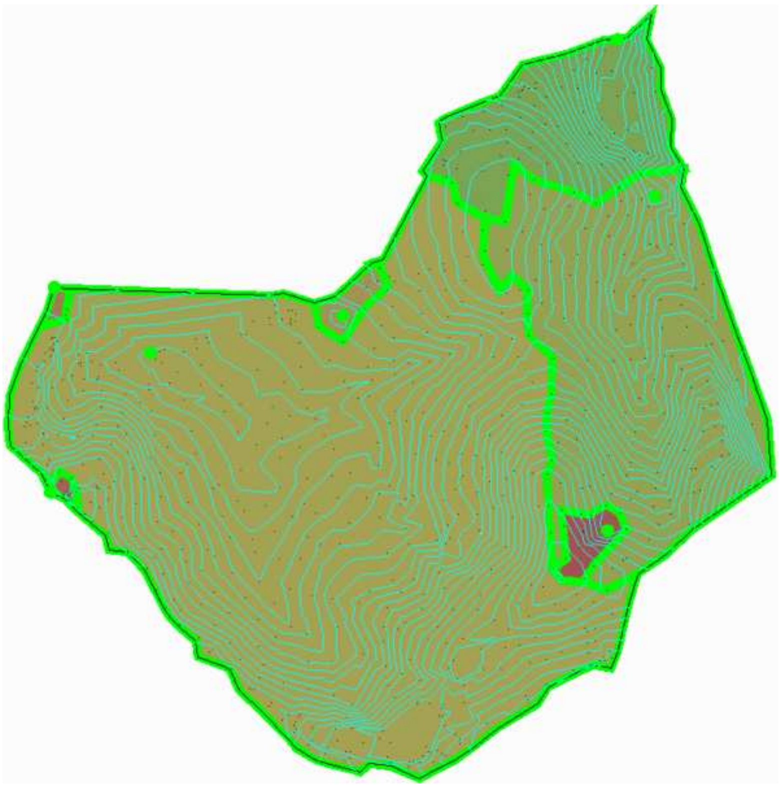


Surface: simo2.tin

☑ Watershed Perimeters
☑ Fill Watershed Areas
☐ Buffer Hatch Width (ft) 5.0
☐ Hatch Structure Areas
☐ Max Flow Lines ☐ Pond Areas
☑ Sink Locations
☐ Spillover Locations
☐ Group Watershed Entities

Rainfall (") 1.0
☐ Allow Overflow Along Boundary

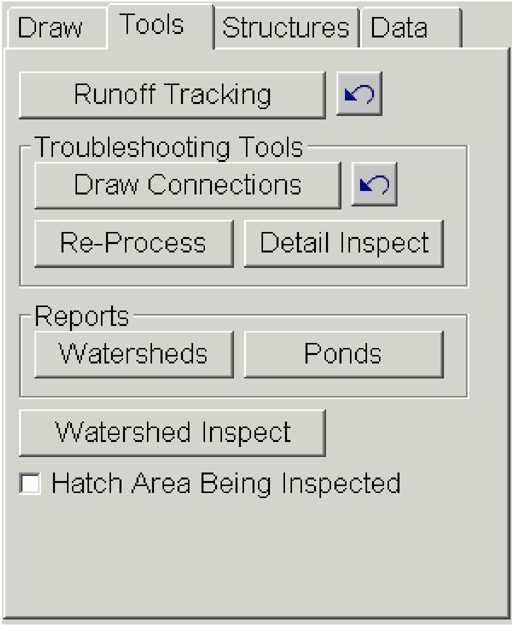
Watershed Analysis calculates the flow connections between the triangles and along the edges of the triangulation. The **Rainfall** amount is used in the processing for figuring the runoff volume to determine when the volume is enough to spillover a local depression in the surface. Besides the Rainfall amount, the runoff coefficients as defined in Define Runoff Layers are also used to calculate the runoff volumes. When the local depression is small enough the runoff will continue through. Otherwise this spot is called a sink for where the runoff stops. The **Round to dZ** is a process option that rounds the elevations of the surface model to simplify the processing. Set this value to zero for no rounding. The **Allow Overflow Along Boundary** option applies to watersheds that have runoff that hits the surface border. This option will check whether this border runoff can spillover and merge with the neighboring watersheds along the border.



The **Draw Watersheds** function draws the watershed areas using the settings under the Draw tab. The back arrow next to the Draw Watersheds button will erase any previous Draw Watershed entities. The **Watershed Perimeters** option will draw closed polyline perimeters for each watershed area. The **Fill Watershed Areas** option will solid fill hatch each area using different colors. The **Buffer Hatch** option will hatch the perimeters of the watershed areas with the specified width instead of hatching in the entire watershed area. The **Hatch Structure Areas** option will hatch the drainage areas covered by structure inlets defined in the Structures tab. The **Sink Locations** setting draws a symbol at the low point for each drainage area. The **High Point Locations** option draws a triangle symbol at the highest point within each watershed. Typically, this high point will be along the watershed boundary polylines that follow the high points along the ridges between the watersheds. The **Pond Areas** option draws a solid fill hatch in blue for the area covered by the runoff volume of low points. In the example shown, the Fill Watershed Areas and Sink Locations options are active. The **Max Flow Lines** option draws polylines for the longest flow line within each watershed. These longest flow polylines can be used to calculate the time of concentration. The **Spillover Location** option draws symbols at low points within the watershed area that fill up with runoff and spillover on the way to the lowest (sink) location of the watershed. The Setup button allows you to specify criteria for identifying spillover points. These settings include the minimum drainage area, storage volume, drainage volume and ponding depth. These settings allow you to filter out small spillover points (ie a pothole) and only draw the significant ones. The **Group Watershed Entities** option will make AutoCAD groups for the set of entities drawn for each watershed. The **Symbol Options** and **Layer Options** buttons allow you to set the symbols and layers to use for the entities created by Watershed Analysis.

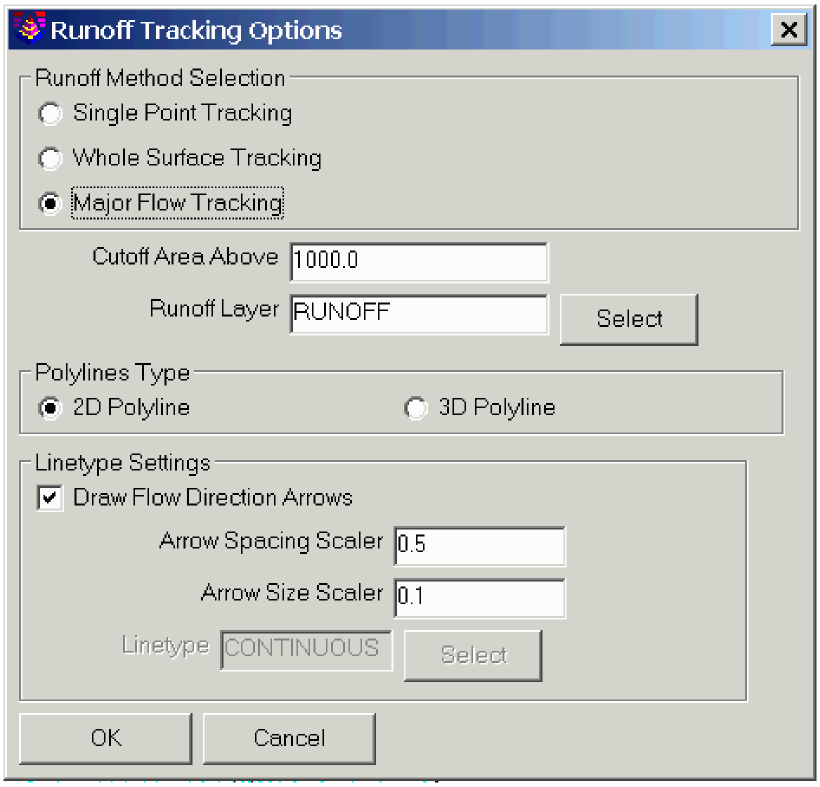
The **Above Point** function reports the watershed data of the current pointer position in real-time as the pointer is moved around. The watershed data is shown in a tooltip next to the pointer position. This data has values for the overall watershed that the position is in including the sink elevation, sink name, drainage area and average slope percent. This data also has values for the watershed above the current point including the drainage area and runoff volume. Plus this data shows the elevation and runoff coefficient at the current point. If the position is picked with the mouse, then the program draws a polyline perimeter for the drainage area above the current point.

The **Above Line** function is similar to Above Point except that you pick two points and the program draws the watershed for all flow that crosses the line between these two points. For example, you can pick points at the left and right banks of a stream to get the drainage area for that stream above these points.


Draw
Tools
Structures
Data
Runoff Tracking
Troubleshooting Tools
Draw Connections
Re-Process
Detail Inspect
Reports
Watersheds
Ponds
Watershed Inspect

☐ Hatch Area Being Inspected

Under the Tools tab there are several analysis routines. The **Runoff Tracking** function draws flow lines that follow the surface. The **Single Point Tracking** method draws the flow lines starting from the picked high points. The **Whole Surface Tracking** method draws a flow line starting from the middle of each triangle in the triangulation. The **Major Flow Tracking** method draws starting in triangles where the drainage area coming into triangle exceeds the specified **Cutoff Area Above** value. The flow lines can be drawn as either 2D or 3D polylines. For 2D polylines, the linetype can be specified or the special linetype with flow direction arrows can be used. This special flow linetype has controls for the size and frequency of the flow arrows.

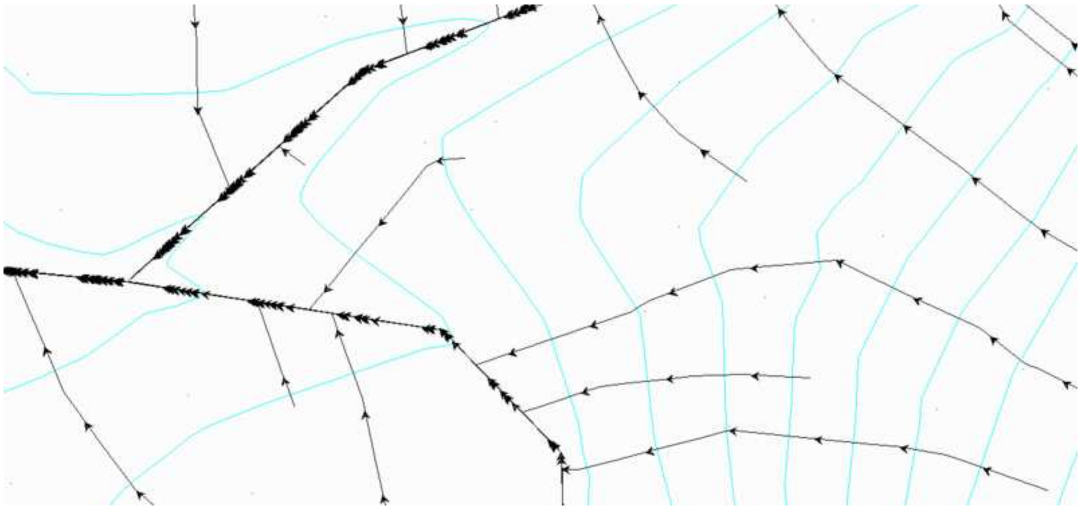

Runoff Tracking Options
Select
Select
OK
Cancel

Runoff Method Selection
○ Single Point Tracking
○ Whole Surface Tracking
● Major Flow Tracking

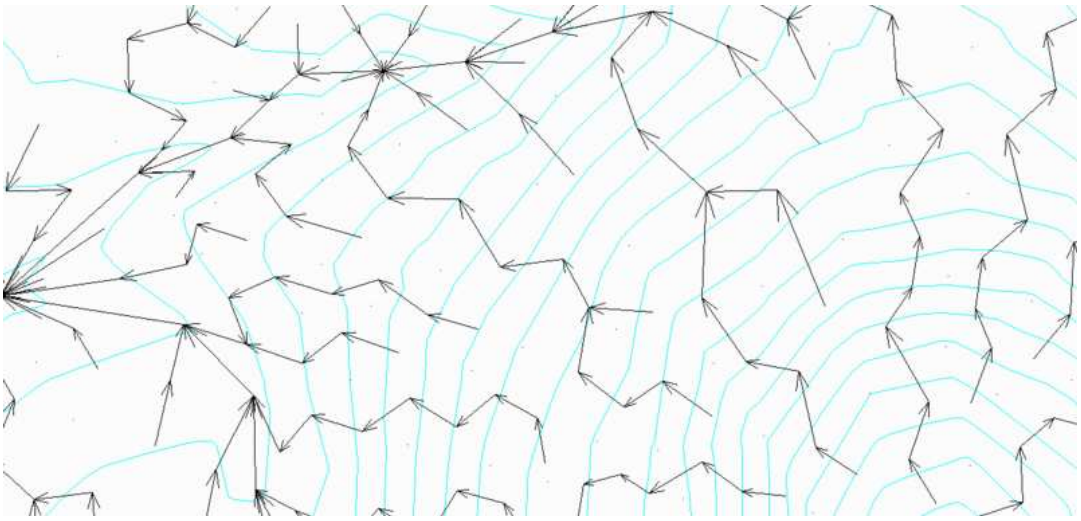
Cutoff Area Above 1000.0
Runoff Layer RUNOFF

Polylines Type
● 2D Polyline ○ 3D Polyline

Linetype Settings
☑ Draw Flow Direction Arrows
Arrow Spacing Scaler 0.5
Arrow Size Scaler 0.1
Linetype CONTINUOUS



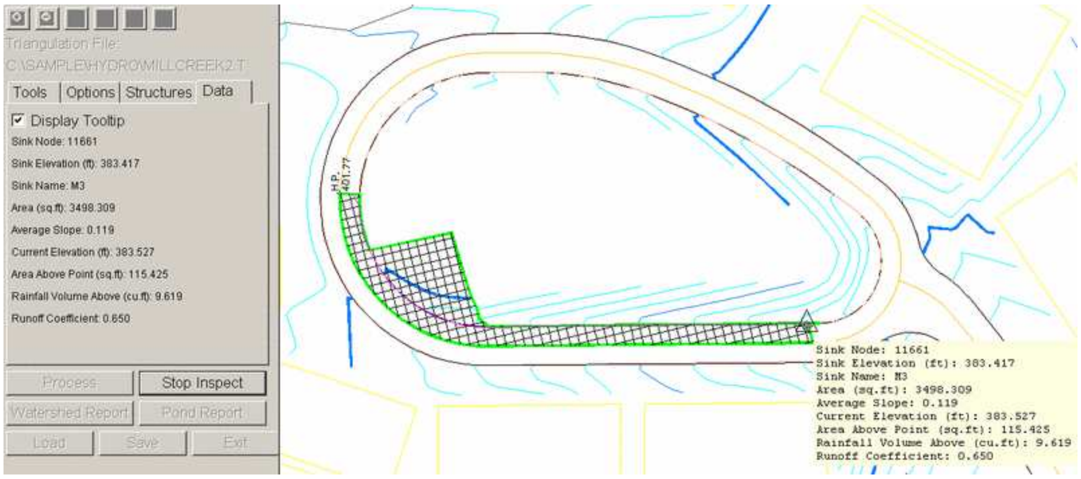
The **Draw Connections** function draws lines with arrows between the triangles for how the program has determined their flow connections.



When a triangulation file is processed by Watershed Analysis, some of the flow connection data is stored into the triangulation file to speed up reprocessing. The **Re-Process** function resets this flow connection data to start the flow calculations from scratch.

The **Detail Inspect** function reports flow connection data at the pointer position in real-time as the pointer is moved. This data includes the current position triangle number, connecting flow triangle number, sink node number, watershed name, border elevation, ridge elevation, low elevation, downstream sink number, number of source triangles, number of source nodes, current elevation and spillover elevation.

The **Watershed Inspect** function reports runoff flow data at the pointer position in real-time as the pointer is moved. The runoff data is shown in a tooltip next to the pointer and in the **Data** tab. This data has values for the overall watershed that the position is in including the sink elevation, sink name, drainage area and average slope percent. This data also has values for the watershed above the current point including the drainage area and runoff volume. Plus this data shows the elevation and runoff coefficient at the current point. When the Hatch Area Being Inspected option is active, the watershed area for the current position is hatched during inspection.

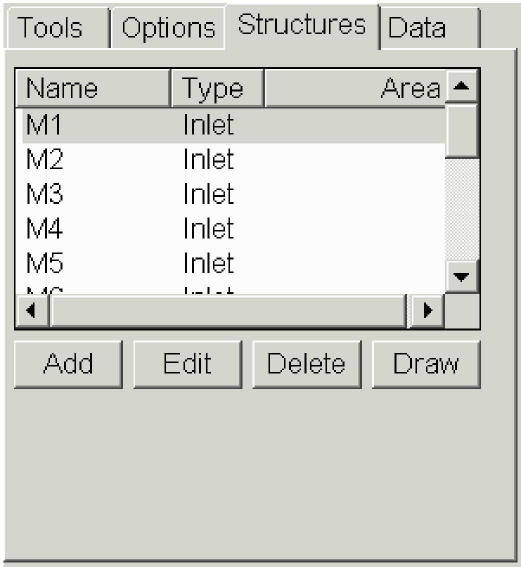


☑ Display Tooltip
Sink Node: 11661
Sink Elevation (ft): 383.417
Sink Name: M3
Area (sq.ft): 3498.309
Average Slope: 0.119
Current Elevation (ft): 383.527
Area Above Point (sq.ft): 115.425
Rainfall Volume Above (cu.ft): 9.619
Runoff Coefficient: 0.650

Sink Node: 11661
Sink Elevation (ft): 383.417
Sink Name: M3
Area (sq.ft): 3498.309
Average Slope: 0.119
Current Elevation (ft): 383.527
Area Above Point (sq.ft): 115.425
Rainfall Volume Above (cu.ft): 9.619
Runoff Coefficient: 0.650

The **Watersheds Report** function runs the report formatter to choose which of the watershed parameters to report. The **Ponds Report** function reports the position and depth of each ponding area.

Besides calculating the runoff of the triangulation surface, Watershed Analysis can also process the runoff effects from structures for inlets, storage ponds, culverts and channels. The structures in Watershed Analysis are simply for placement and watershed delineation. These structures do not have design considerations for parameters like pipe size. In the **Structure** tab, there is a list of the structures to apply with the current surface. The list shows the name, type and drainage area for each structure. The Draw function will draw symbols for each structure. The Inlet structures act as sinks in the watershed and capture all the flow that comes to the inlet point. Each inlet is defined by a single point and a name. The Storage Tank structures also act as sinks and are defined by a single point and name. The Culvert structures route the flow from the culvert inlet to the outlet. The culverts are defined by two points for the inlet and outlet and by a name. The Channel structure is the same as the Culvert except that it can have more than two points to define the flow path. The structure data can be stored to a Watershed Structure File (wst) using the **Save** button. The **Load** button can read the structure data from either a wst file or from a sewer network file (.sew).



Name	Type	Area
M1	Inlet	
M2	Inlet	
M3	Inlet	
M4	Inlet	
M5	Inlet	

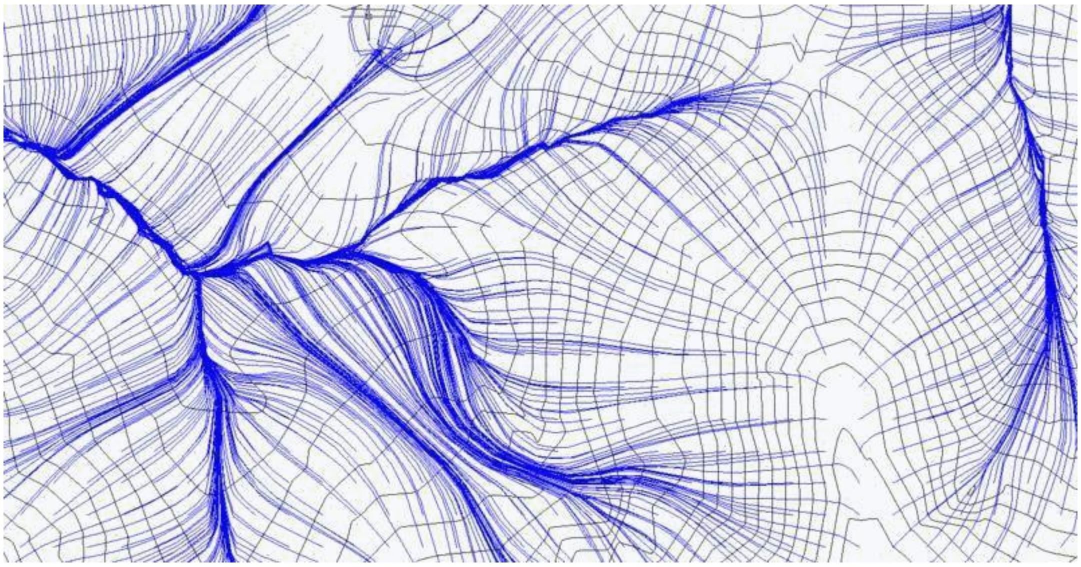
Pulldown Menu Location: Watershed
Keyboard Command: watershed
Prerequisite: Triangulation File

Run Off Tracking

This command draws 3D polylines starting at user picked points downhill until they reach a local minimum or the end of the grid or TIN. In effect it simulates the path of a rain drop. The surface is modeled by a grid file as created by Make 3D Grid File or a triangulation file created by Triangulate & Contour. The program also reports the horizontal and slope distances, average slope, maximum slope, and vertical drop. These values can be used for time of concentration calculations. Runoff tracking is a convenient way to identify distinct watershed areas and is an alternative to the automated Watershed Analysis command.

Prompts

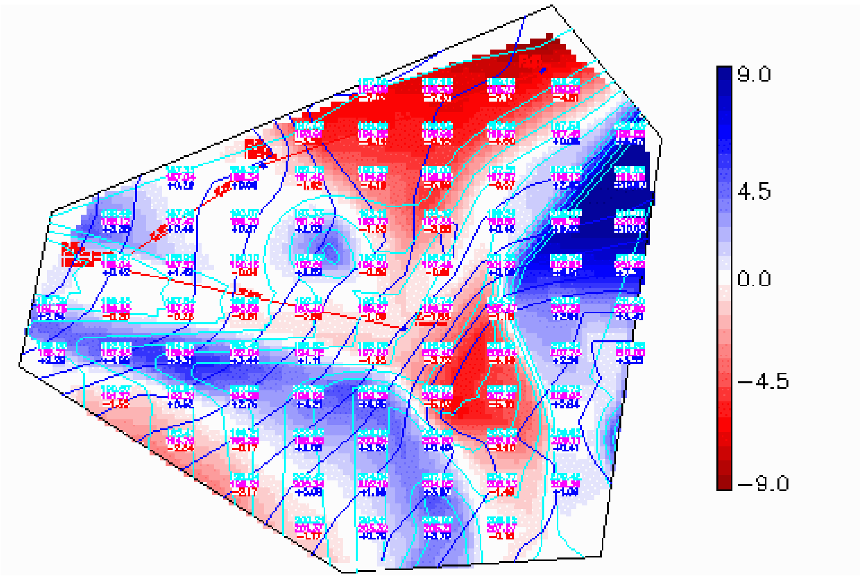
Enter the run off path layer <RUNOFF>: *press Enter*
Select Surface Model dialog box
Choose the grid file or triangulation file that models the surface. If a grid is selected, it will prompt:
Extrapolate grid to full grid size (Yes/<No>)? *Yes* If the limits of the surface data doesn't cover the entire grid area, then the values for the grid cells beyond the data limit must be extrapolated in order to compute slopes in that area. This prompt only appears if there are grid cells without values.
Local pond spillover depth <4.80>: *press Enter* This allows the runoff line to continue past flat or low points in the grid or TIN, by allowing these area to fill up with water, in essence, up to the specified depth, thus letting the runoff polyline continue on.
Draw tracking for all grid cells or pick individuals [All/<Pick>]: *press Enter* Pressing Enter leads to individual picking of runoff tracking lines, while A for All would fill draw runoff polylines starting from each grid cell or each triangulation triangle.
Pick origin of rain drop: *pick a point at the top of the run off polyline*
Pick origin of rain drop (Enter to end): *press Enter*



Pulldown Menu Location: Watershed
Keyboard Command: runoff
Prerequisite: A .grd file created by Make 3D Grid File or a .flt (TIN) file created by Triangulate & Contour.

Cut/Fill Map Legend

This command will draw a Cut/Fill Map Legend on your drawing. It will display the cut/fill amount, color, and range, as seen below.



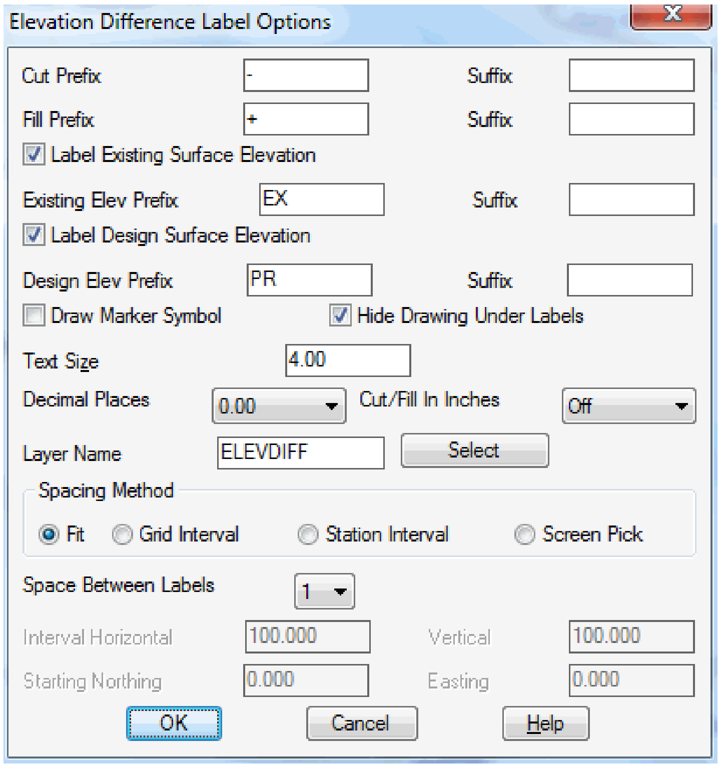
Prerequisite: Cut/Fill amounts
Keyboard Command: CF_MAP_LEGEND

Cut/Fill Labels

This command displays the design elevation, the existing elevation, and the amount to either cut or fill directly on the screen. The design and existing elevations can be defined by triangulation files, grid files or points.

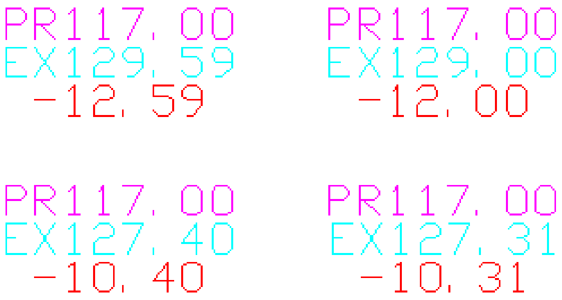
In the Elevation Difference Label Options dialog, you can customize the Cut/Fill labels. Text can be added either before or after the Cut/Fill amount, the Existing elevation, and the Design elevation with the Prefix and Suffix fields. You can also choose whether or not to display the Existing Surface elevations and the Design Surface elevations. The Draw Marker Symbol option draws an X symbol for where each label represents. The Hide Drawing Under Labels option creates Wipeout entities around the labels so that you can read the labels clearly. Text Size chooses the text size for each line of the label. Text Style allows you change the Font Style displayed in the labels. Decimal Places sets to how many decimal places the labels will report. The Cut/Fill In Inches labels in feet and inches to the specified precision. The Spacing Methods include:
Fit: Uses an inclusion perimeter and the size of the labels to make a series of rows and columns of labels that fit within the perimeter. The Space Between Labels sets the buffer around labels. The size of each space is determined by the Text Size.
Grid Interval: Places the labels at the specified Horizontal and Vertical Intervals starting with the specified Northing and Easting coordinate.
Station Interval: Uses a centerline polyline and places the labels at a station interval along this alignment.
Screen Pick: Prompts for each label position.

The following image shows the main dialog box for setting the labeling options.

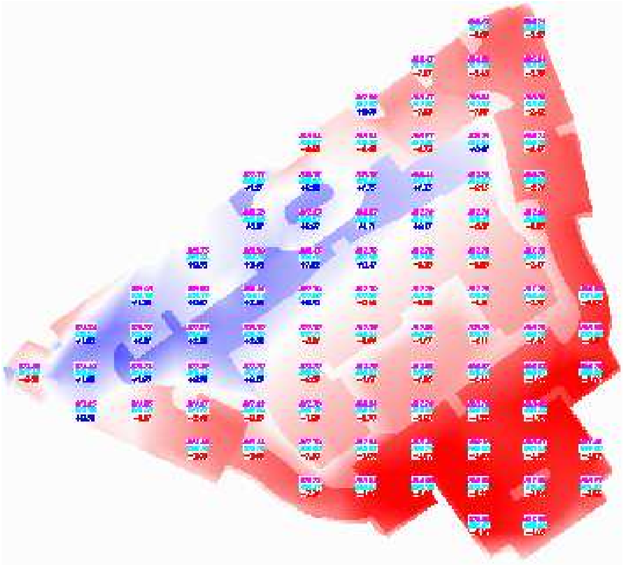

Elevation Difference Label Options
Select
OK
Cancel
Help

Cut Prefix: - Suffix:
Fill Prefix: + Suffix:
☑ Label Existing Surface Elevation
Existing Elev Prefix: EX Suffix:
☑ Label Design Surface Elevation
Design Elev Prefix: PR Suffix:
☐ Draw Marker Symbol ☑ Hide Drawing Under Labels
Text Size: 4.00
Decimal Places: 0.00 Cut/Fill In Inches: Off
Layer Name: ELEVDIFF
Spacing Method: ● Fit ○ Grid Interval ○ Station Interval ○ Screen Pick
Space Between Labels: 1
Interval Horizontal: 100.000 Vertical: 100.000
Starting Northing: 0.000 Easting: 0.000

The labeling created with these options looks like this:


PR117.00
EX129.59
-12.59
PR117.00
EX129.00
-12.00
PR117.00
EX127.40
-10.40
PR117.00
EX127.31
-10.31

The distribution of the labels on the site looks like this:



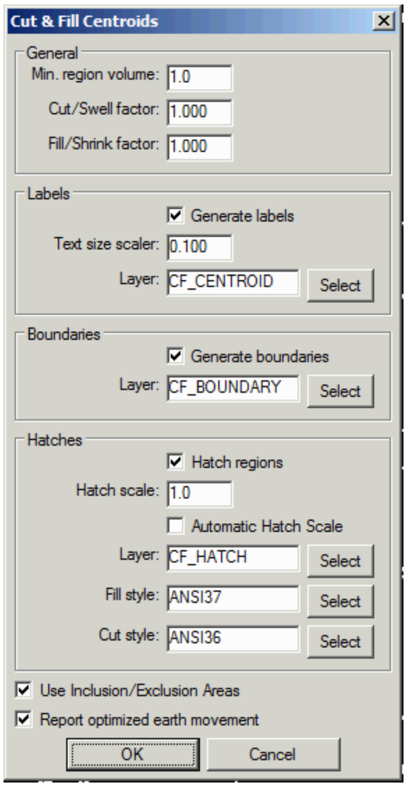
Pulldown Menu Location: Surface> Cut/Fill Utilities
Keyboard Command: elevdiff
Prerequisite: Existing and design surfaces

Cut/Fill Centroids

This command calculates all the areas of cut and fill between two triangulation surfaces. The center of mass or centroid for each area is calculated. The Minimum Region Volume is an optional filter that will skip reporting areas with volumes less than the specified amount. The Generate Labels option draws a symbol at the centroid and text for the region name and volume**.** The Generate Boundaries option draws closed polylines for the perimeters for each area. The Hatch Regions option is used to visually shows cut/fill areas in your drawing. Separate hatch patterns can be used for cut and fill areas.

The Use Inclusion/Exclusion Areas option will make the program prompt for polyline perimeters for the inclusion and exclusion areas on the site. For example, use an inclusion perimeter to calculate within an area of interest. When this option is off, the program uses the full extent of the surfaces.

A report is generated with the volumes and centroids for all the cut and fill areas. When the Report Optimized Earth Movement option is active, the report includes a list of the earthwork movements between cut and fill areas that minimizes the overall earthwork movement (volume $*$ distance) where the distance is distance between the centroids.

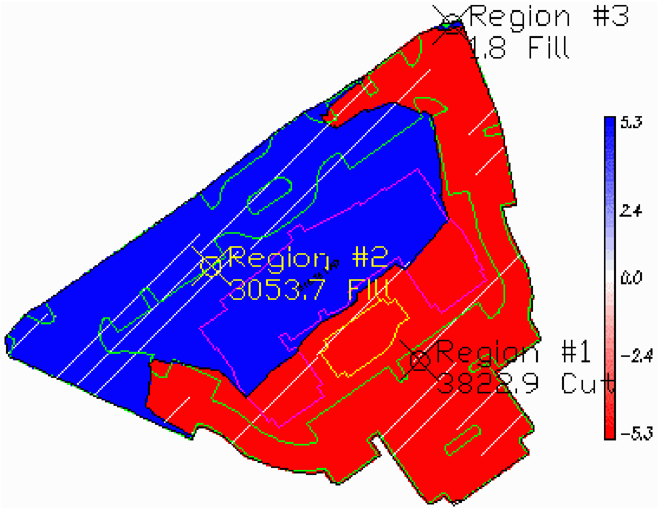


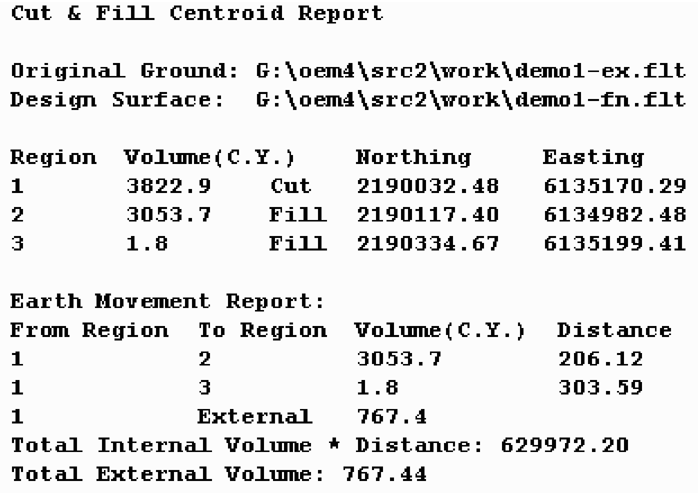
Min. region volume: 1.0
Cut/Swell factor: 1.000
Fill/Shrink factor: 1.000

☑ Generate labels
Text size scaler: 0.100
Layer: CF_CENTROID

☑ Generate boundaries
Layer: CF_BOUNDARY

☑ Hatch regions
Hatch scale: 1.0
☐ Automatic Hatch Scale
Layer: CF_HATCH
Fill style: ANSI37
Cut style: ANSI36
☑ Use Inclusion/Exclusion Areas
☑ Report optimized earth movement





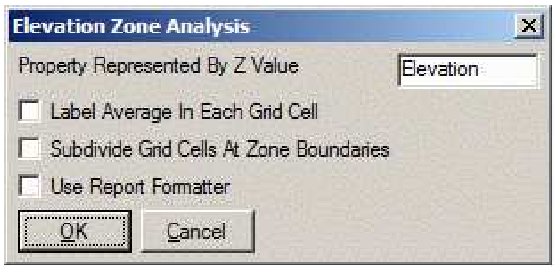
```
Cut & Fill Centroid Report

Original Ground: G:\oem4\src2\work\demo1-ex.flt
Design Surface:  G:\oem4\src2\work\demo1-fn.flt

Region  Volume(C.Y.)     Northing      Easting
1        3822.9     Cut    2190032.48    6135170.29
2        3053.7     Fill   2190117.40    6134982.48
3        1.8        Fill   2190334.67    6135199.41

Earth Movement Report:
From Region   To Region   Volume(C.Y.)   Distance
1             2           3053.7         206.12
1             3           1.8            303.59
1             External    767.4
Total Internal Volume * Distance: 629972.20
Total External Volume: 767.44
```

Here is the Cut and Fill Centroid Report for the above example. It shows the volumes, the coordinates of the centroids, and the Earth Movement Report. The Earth Movement Report shows the minimal distances for moving Cut to Fill areas.

Prerequisite: Existing and Design surfaces
Keyboard Command: tk_cutfillc

Elevation Zone Analysis

This command can be used to calculate the surface area of a surface in different elevation zone ranges and to analyze a surface by ranges or "zones" of elevation. The program requires 3D Face entities that can be generated by the *Draw 3D Grid File* command. The *Draw Triangulation Faces* option in *Triangulate & Contour* or *Draw Triangular Mesh* routine under Surface >> Draw Surfaces menu can also be used to create triangular 3D Faces. For each elevation zone, the 3D Faces can be hatched with a hatching pattern, solid filled with the SOLID pattern, or left empty with the NONE pattern. The 3D Faces are also placed in a separate layer for each zone.



Property Represented By Z Value: Elevation

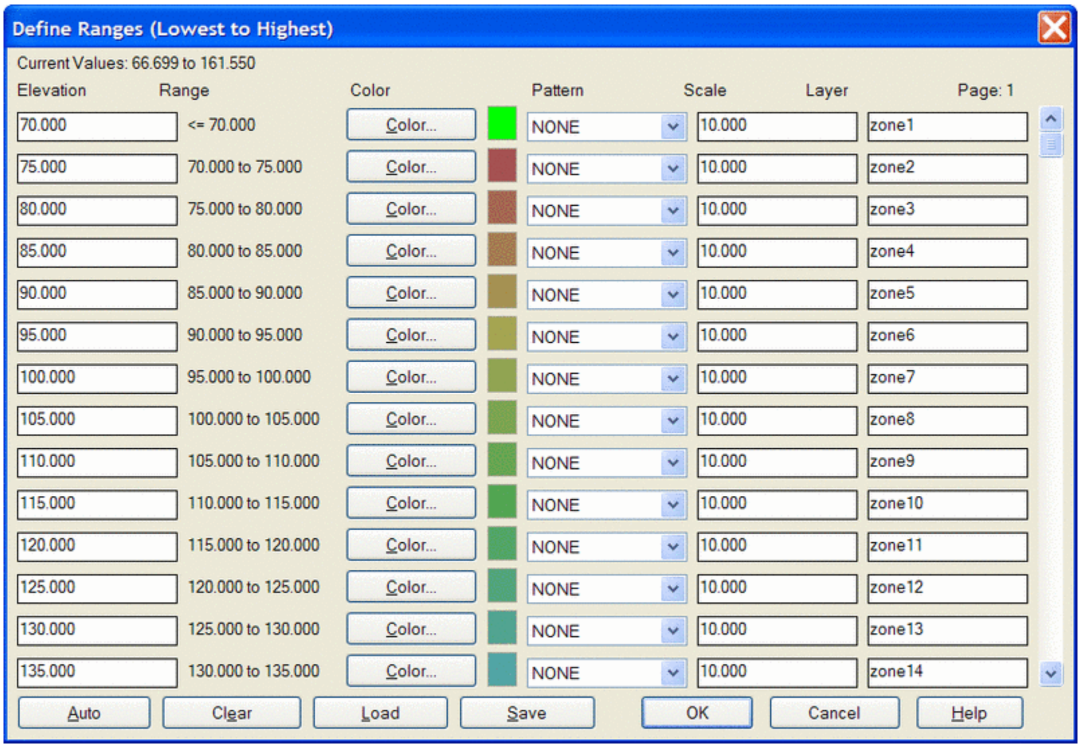
☐ Label Average In Each Grid Cell

☐ Subdivide Grid Cells At Zone Boundaries

☐ Use Report Formatter

In the options dialog, the Property Represented By Z Value sets the name used in the reports for the type of surface model. Label Average In Each Grid Cell creates text labels in the center of each 3D Face of the surface with the average surface value. Subdivide Grid Cells at Zone Boundaries gives higher resolution at the transition between zones. Use Report Formatter allows for customized report and different output formats.

There are also options to specify inclusion and exclusion areas. When inclusion areas are specified, only the area within the inclusion polyline is calculated. Areas within an exclusion polyline are not included in the calculations. Inclusion and exclusion areas are represented by closed polylines and must be drawn prior to calling this routine. Without inclusion and exclusion polylines, all the area of each selected 3D Face is used.



Current Values: 66.699 to 161.550

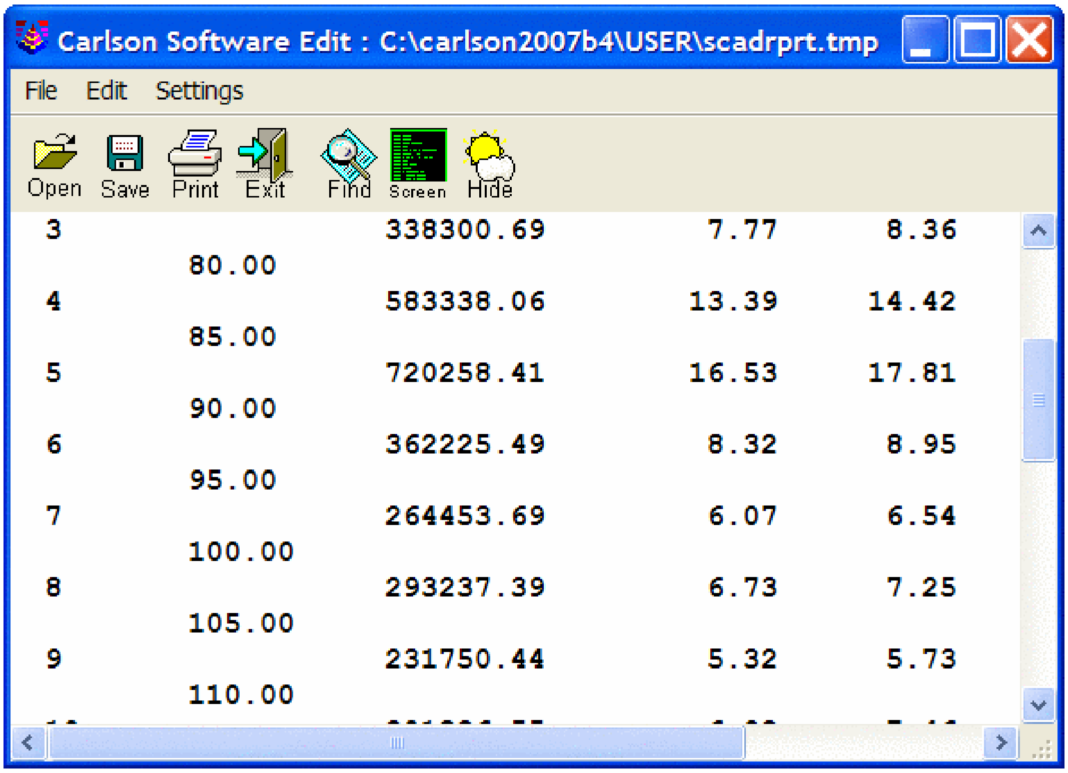
Elevation	Range	Color		Pattern	Scale	Layer
70.000	<= 70.000	Color...	🟩	NONE	10.000	zone1
75.000	70.000 to 75.000	Color...	🟥	NONE	10.000	zone2
80.000	75.000 to 80.000	Color...	🟫	NONE	10.000	zone3
85.000	80.000 to 85.000	Color...	🟫	NONE	10.000	zone4
90.000	85.000 to 90.000	Color...	🟫	NONE	10.000	zone5
95.000	90.000 to 95.000	Color...	🟨	NONE	10.000	zone6
100.000	95.000 to 100.000	Color...	🟩	NONE	10.000	zone7
105.000	100.000 to 105.000	Color...	🟩	NONE	10.000	zone8
110.000	105.000 to 110.000	Color...	🟩	NONE	10.000	zone9
115.000	110.000 to 115.000	Color...	🟩	NONE	10.000	zone10
120.000	115.000 to 120.000	Color...	🟩	NONE	10.000	zone11
125.000	120.000 to 125.000	Color...	🟩	NONE	10.000	zone12
130.000	125.000 to 130.000	Color...	🟩	NONE	10.000	zone13
135.000	130.000 to 135.000	Color...	🟩	NONE	10.000	zone14

Prompts

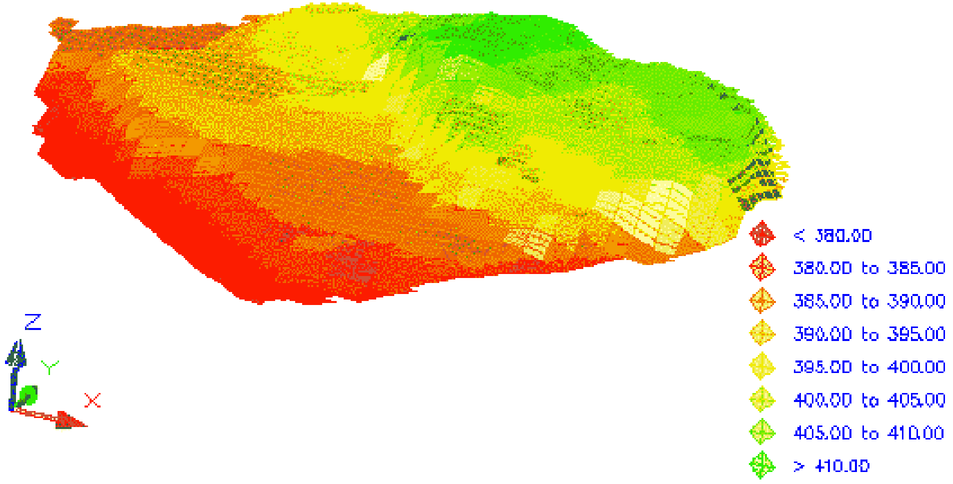
Elevation Zone Analysis dialog
Select 3D Faces to Analyze...
Select objects: *pick the 3D Faces to process*
Define Ranges (Lowest to Highest) Dialog
Specify the elevation ranges, colors and patterns.
Select the Inclusion perimeter polylines or ENTER for none:
Select objects: *pick a closed polyline for the limits of disturbed area*
Select objects: *press Enter*
Select the Exclusion perimeter polylines or ENTER for none:

Select objects: *press Enter*
Select point for color legend (Enter for none): *pick a point*
If a point is picked, a legend showing the color of each range is drawn. The legend is drawn aligned to the current view *UCS*. For this reason it is best to have the mesh at the *Vpoint* at which it will be plotted before executing the analysis program.

A report is also generated in the standard report viewer.


Carlson Software Edit : C:\carlson2007b4\USER\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
 3                    338300.69        7.77      8.36
          80.00
 4                    583338.06       13.39     14.42
          85.00
 5                    720258.41       16.53     17.81
          90.00
 6                    362225.49        8.32      8.95
          95.00
 7                    264453.69        6.07      6.54
         100.00
 8                    293237.39        6.73      7.25
         105.00
 9                    231750.44        5.32      5.73
         110.00
```


Z
Y
X
< 380.00
380.00 to 385.00
385.00 to 390.00
390.00 to 395.00
395.00 to 400.00
400.00 to 405.00
405.00 to 410.00
> 410.00

Result of Elevation Zone Analysis viewed in 3D and shaded

Pulldown Menu Location: Surface
Keyboard Command: elvzone
Prerequisite: displayed 3D Face entities.

Slope Report

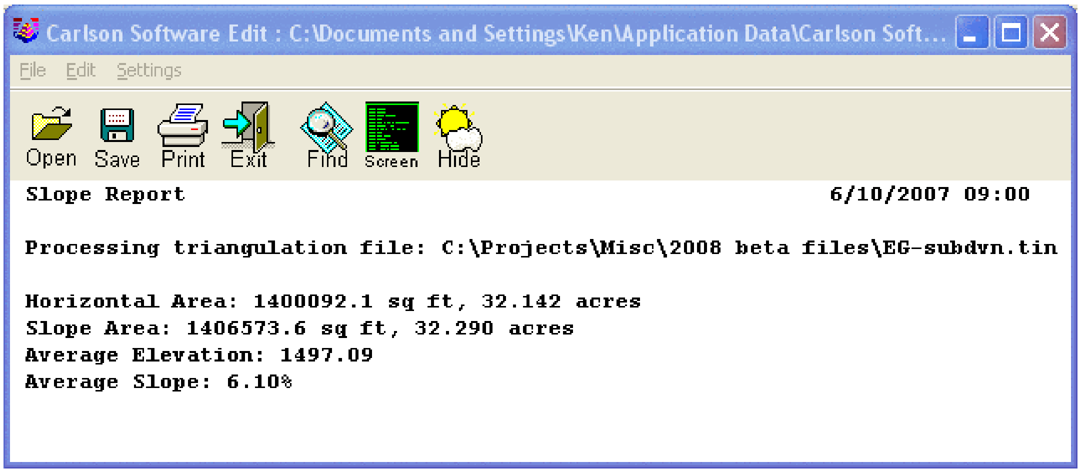
This command calculates the sloped surface area, average slope and average elevation on a site. The surface can be defined by a surface model file, (.GRD, .TIN or .FLT), or generated from 3D entities on the screen. Sloped area information is useful to compute seeding quantities for hillsides, for example.

For the screen method, the surface is modeled from the user-selected entities such as contour polylines. Besides the surface entities, a perimeter polyline is used as the inclusion area for the slope report. If the perimeter polyline is on the PERIMETER layer, the command will locate it automatically.

For area reports, there are options to specify inclusion and exclusion perimeters. When inclusion perimeters are specified, only the area within the inclusion perimeters is calculated. The area within exclusion perimeters is not included in the calculations. Inclusion and exclusion perimeters are represented by closed polylines and must be drawn prior to running this routine.

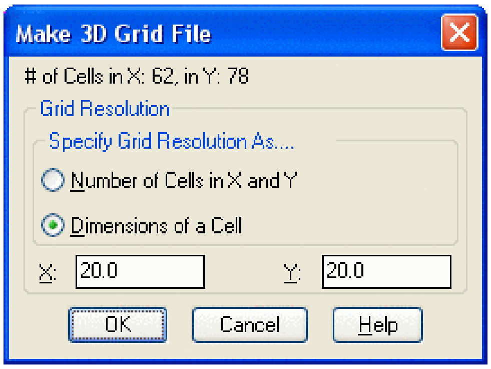
Prompts

For Area report using a File:
Slope report by area or two points [Area/<Points>]? *A for Area*
Source of surface model (<File>/Screen)? *F for File*
Select surface model file.
Select the Inclusion perimeter polylines or ENTER for none: *pick any inclusion polylines*
Select the Exclusion perimeter polylines or ENTER for none: *pick any exclusion polylines*
Note: If the surface model file is a grid file (.GRD), you are prompted whether to extrapolate the grid to full grid size.


Carlson Software Edit : C:\Documents and Settings\Ken\Application Data\Carlson Soft...
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Slope Report                                               6/10/2007 09:00

Processing triangulation file: C:\Projects\Misc\2008 beta files\EG-subdvn.tin

Horizontal Area: 1400092.1 sq ft, 32.142 acres
Slope Area: 1406573.6 sq ft, 32.290 acres
Average Elevation: 1497.09
Average Slope: 6.10%
```

For Area report by *Screen* method:
Slope report by area or two points [Area/<Points>]? *A for Area*
Source of surface model (<File>/Screen)? *S for Screen*
Ignore zero elevations (<Yes>/No)? *press Enter*
Select surface entities and perimeter.
Select objects: *pick the objects*
If no polyline is found on layer PERIMETER, you are prompted to: Select Pond/Pit perimeter polyline.
The Make 3D Grid File dialog is presented. Pick *OK*.



# of Cells in X: 62, in Y: 78

○ Number of Cells in X and Y
● Dimensions of a Cell

X: 20.0 Y: 20.0

Select the Inclusion perimeter polylines or ENTER for none: *pick any inclusion polylines*
Select the Exclusion perimeter polylines or ENTER for none: *pick any exclusion polylines*

For *Points* method:
Slope report by area or two points [Area/<Points>]? *P for Points*
Select surface model file.
Pick first point:
Pick Second point:
The slope report is displayed on the command line for the 3D vector, projected on the surface, defined by those 2 picks.

```
Point 1: 5119.646,5640.322,98.979
Point 2: 4951.964,6022.419,135.546
Horiz Dist: 417.27 Slope Dist: 418.87 Elv Diff: 36.57
Slope: 8.76 Ratio: 11.41:1
```

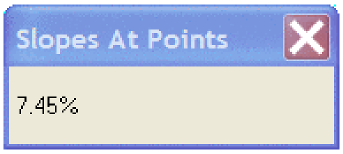
Pulldown Menu Location: Surface >> Slope Analysis
Keyboard Command: sarea
Prerequisite: A surface file or screen entities of the surface.

Slope At Points

This command labels the slope percent at user Screen Picked points or Surface Points. Surface Points can work well on grid files, (.GRD), but is typically too much information for triangulated surface files (.TIN or .FLT).

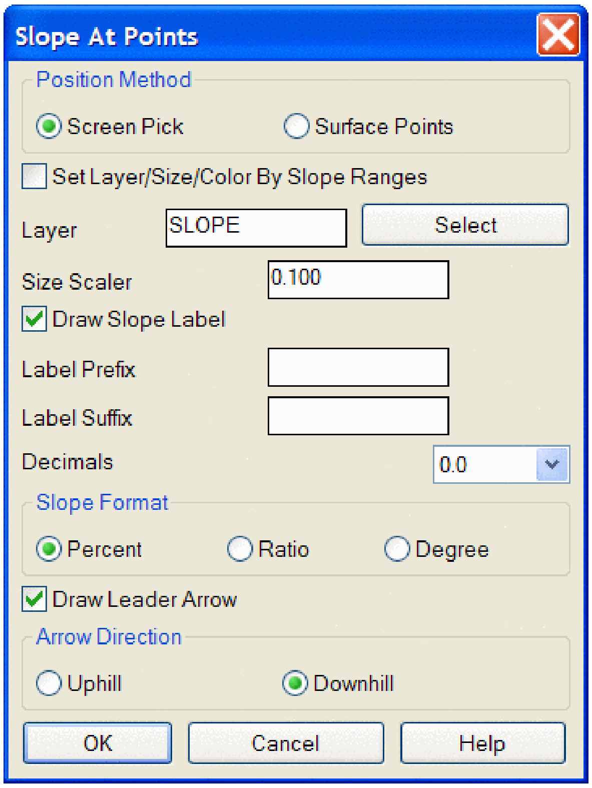
The slope is computed from the surface model file (.TIN, .GRD, or .FLT).

As the crosshairs are moved across the surface, the slope at the current position is displayed in a floating dialog box.



7.45%

In addition to labeling the slope value at the user specified points, a Leader Arrow can be drawn in either the uphill or downhill direction. The dialog also allows you to specify Label Prefixes and/or Suffixes, Decimal Precision, and Slope Format.



Slope At Points

Position Method: ● Screen Pick ○ Surface Points

☐ Set Layer/Size/Color By Slope Ranges

Layer: SLOPE

Size Scaler: 0.100

☑ Draw Slope Label

Label Prefix:

Label Suffix:

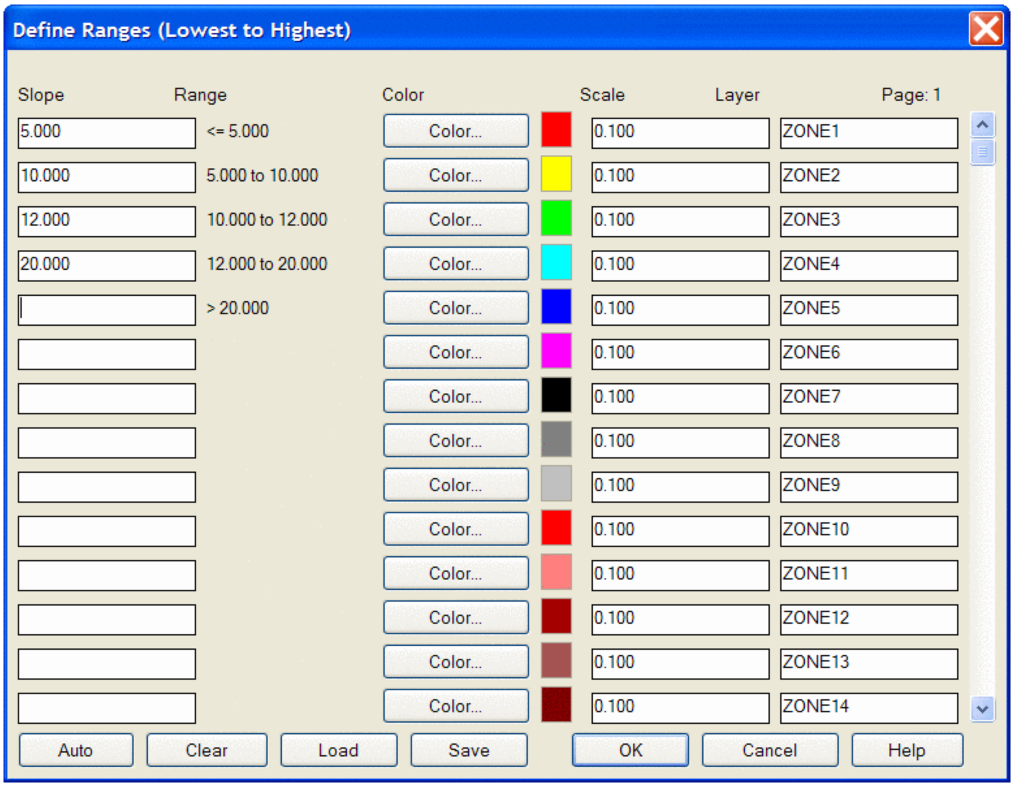
Decimals: 0.0

Slope Format: ● Percent ○ Ratio ○ Degree

☑ Draw Leader Arrow

Arrow Direction: ○ Uphill ● Downhill

The Set Layer/Size/Color By Slope Ranges option invokes the Define Ranges dialog box. Enter slope values in the first column of boxes to set the Ranges.



Define Ranges (Lowest to Highest)

Slope	Range	Color		Scale	Layer
5.000	<= 5.000	Color...	■	0.100	ZONE1
10.000	5.000 to 10.000	Color...	■	0.100	ZONE2
12.000	10.000 to 12.000	Color...	■	0.100	ZONE3
20.000	12.000 to 20.000	Color...	■	0.100	ZONE4
	> 20.000	Color...	■	0.100	ZONE5
		Color...	■	0.100	ZONE6
		Color...	■	0.100	ZONE7
		Color...	■	0.100	ZONE8
		Color...	■	0.100	ZONE9
		Color...	■	0.100	ZONE10
		Color...	■	0.100	ZONE11
		Color...	■	0.100	ZONE12
		Color...	■	0.100	ZONE13
		Color...	■	0.100	ZONE14

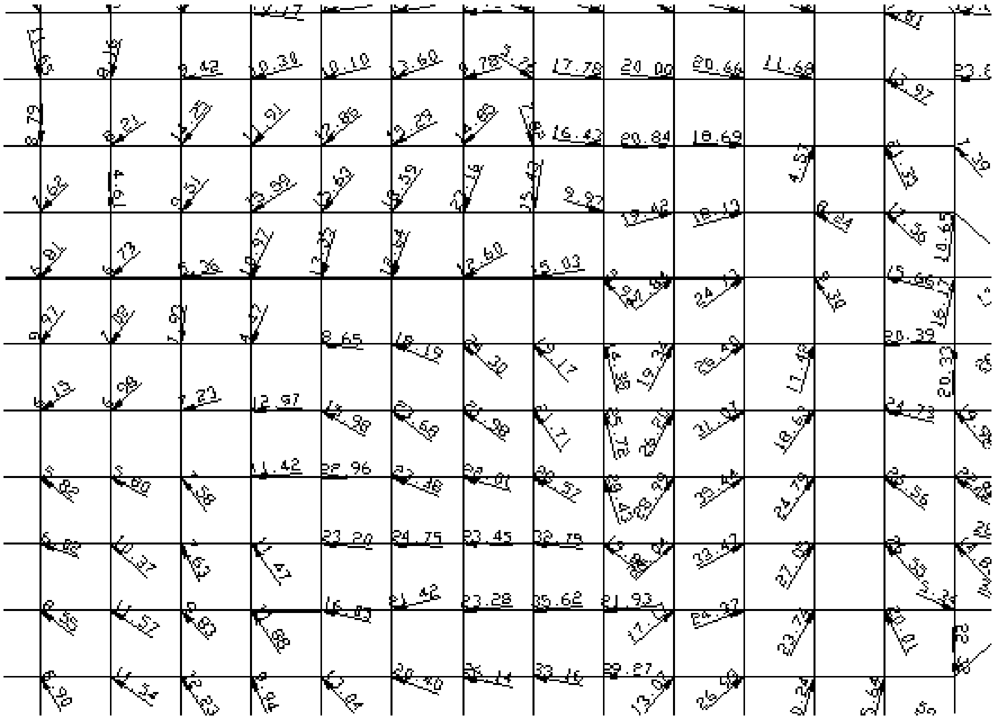
Prompts

Slope At Points dialog box

Adjust settings as desired. Pick OK.

Select Surface Model.

Pick Points to label slope.



Draw grid file and Slope At Point labels using Surface Points

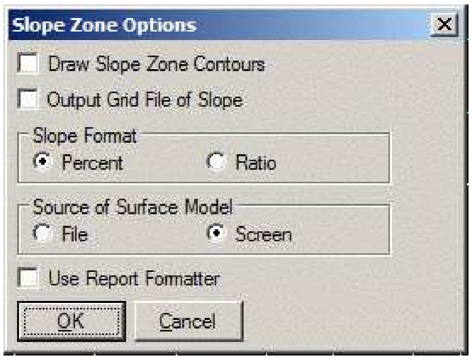
Pulldown Menu Location: Surface >> Slope Analysis

Keyboard Command: ptslope

Prerequisite: A surface model file (.TIN, .GRD, or .FLT)

Slope Zone Analysis

This command calculates the surface area of a site in different slope zone ranges. This command can use either a surface model file, (.TIN, .GRD, or .FLT), or 3D Face drawing entities, which can be generated by the *Plot 3D Grid File* command, the *Draw Triangular Mesh* command, or the Draw Triangulation Faces option of *Triangulate & Contour*. For each slope zone, the 3D Faces can be hatched with any hatch pattern, including the SOLID pattern, or left empty with the NONE pattern. The command reports the area for each slope zone. The Use Report Formatter option allows for customized reports and different output formats.



Slope Zone Options

☐ Draw Slope Zone Contours

☐ Output Grid File of Slope

Slope Format

● Percent ○ Ratio

Source of Surface Model

○ File ● Screen

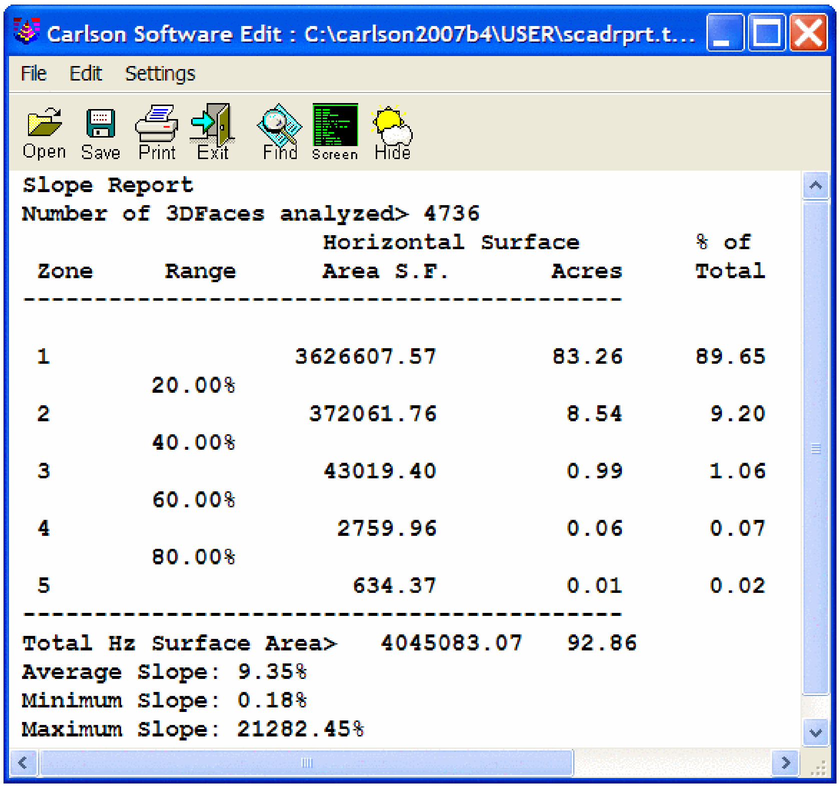
☐ Use Report Formatter

This command can also generate contours of the slope zones based on the calculated slope at each point of the 3D Faces. The slopes can vary greatly between neighboring points. When contoured directly, these slope data points produce incoherent contours. Instead this routine applies a filtering algorithm that reduces the noise. There is another option to output a grid file of the slope values.

There are also options to specify inclusion and exclusion areas. When inclusion areas are specified, only the slope area within the inclusion polyline is calculated. Slope area within an exclusion polyline are not included in the calculations. Inclusion and exclusion areas are represented by closed polylines and must be drawn prior to calling this routine. Without inclusion and exclusion polylines, all the slope area of each selected 3D Face is used.

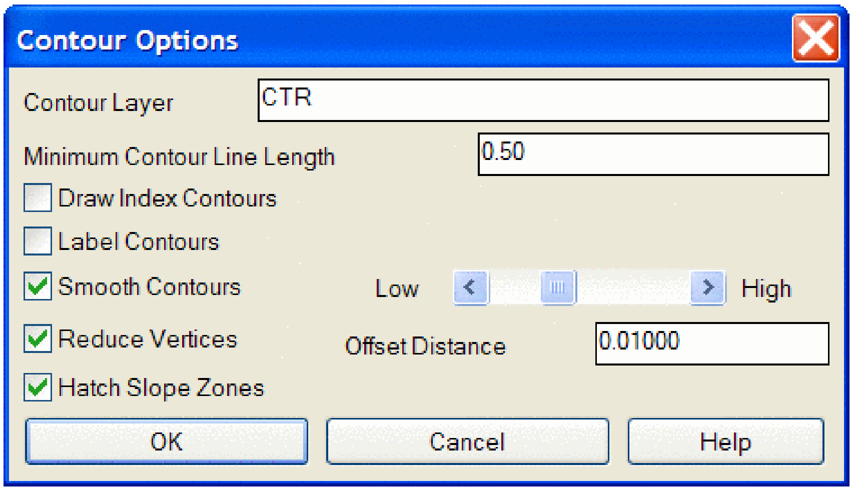
Prompts

Source of surface model: [File/<Screen>]? *F* for File
Slope Zone Options dialog box. Choose whether to Draw Slope Zone Contours, whether to Output Grid File of Slope, and Slope Format. Pick *OK*
Select surface model file.
Define Ranges dialog. Specify the slope zones, colors and patterns from lowest to highest. Pick *OK*.
Select the Inclusion perimeter polylines or ENTER for none: *select perimeter(s)* or *press Enter*
Select the Exclusion perimeter polylines or ENTER for none: *select perimeter(s)* or *press Enter*
Report is generated.



```
Slope Report
Number of 3DFaces analyzed> 4736
                     Horizontal Surface       % of
 Zone     Range      Area S.F.       Acres     Total
------------------------------------------

 1                 3626607.57        83.26     89.65
         20.00%
 2                  372061.76         8.54      9.20
         40.00%
 3                   43019.40         0.99      1.06
         60.00%
 4                    2759.96         0.06      0.07
         80.00%
 5                     634.37         0.01      0.02
------------------------------------------
Total Hz Surface Area>   4045083.07   92.86
Average Slope: 9.35%
Minimum Slope: 0.18%
Maximum Slope: 21282.45%
```

If you choose to draw Slope Zone Contours, the Contour Options dialog box is presented.



Contour Layer: CTR

Minimum Contour Line Length: 0.50

☐ Draw Index Contours

☐ Label Contours

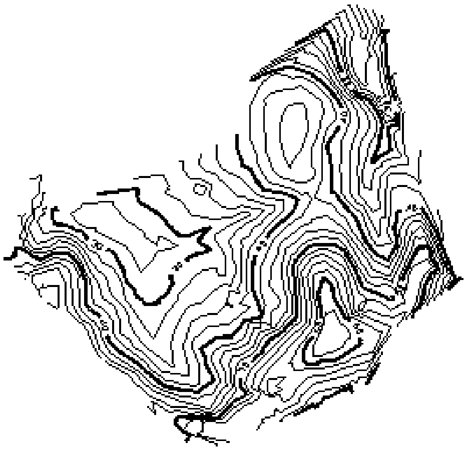
☑ Smooth Contours

☑ Reduce Vertices

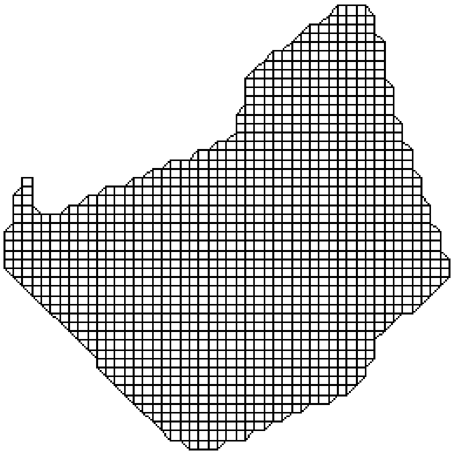
Offset Distance: 0.01000

☑ Hatch Slope Zones

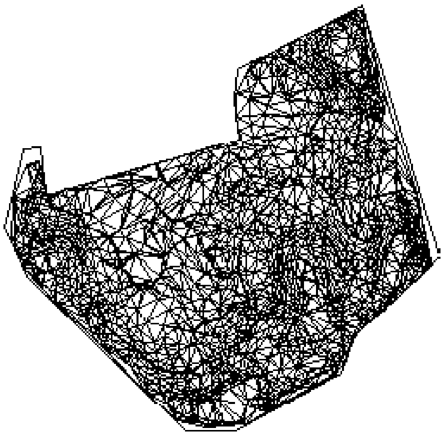
Note: If you choose to use Screen entities instead of a surface model file, you are prompted whether to:
Apply hatch patterns to grid cells [Yes/<No>]? and
Freeze grid layer after processing [Yes/<No>]?



Surface contours

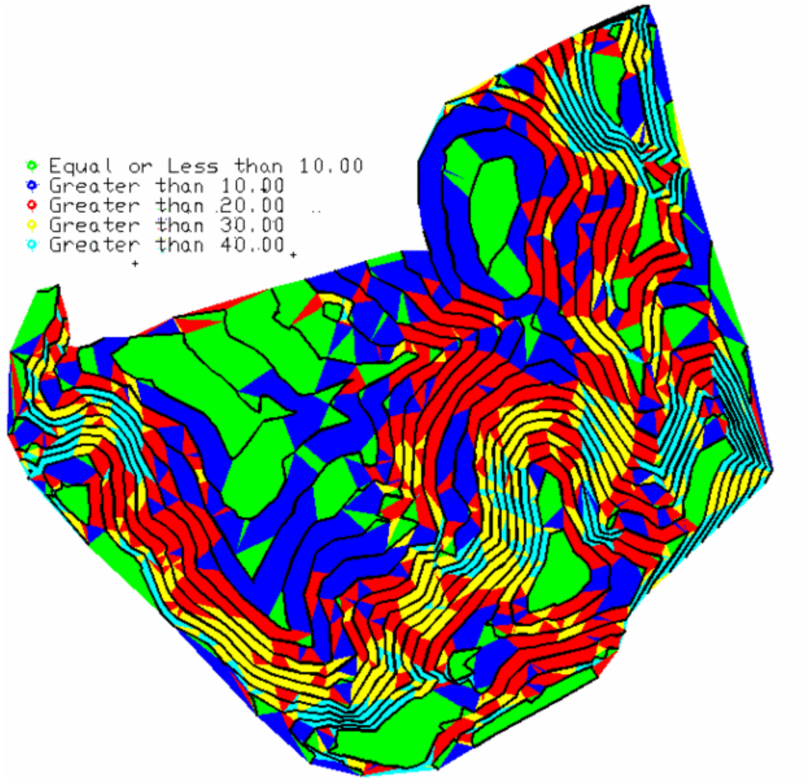


3D Faces from a grid surface model

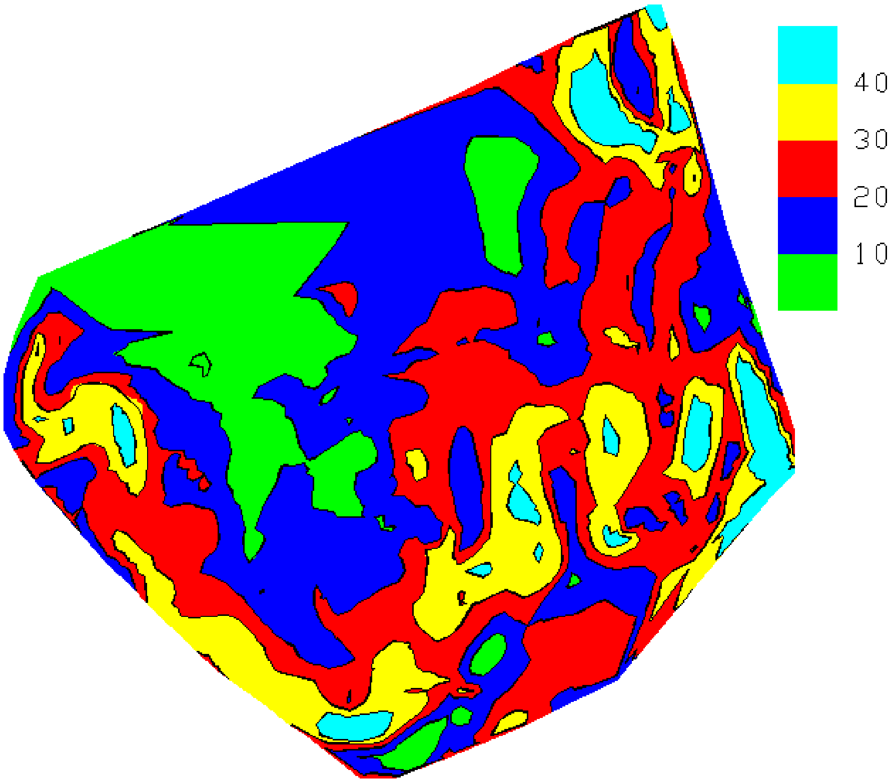


3D Faces created by *Triangulate & Contour* with the Draw Triangulation Faces option

Slope zone contours


Equal or Less than 10.00
Greater than 10.00
Greater than 20.00
Greater than 30.00
Greater than 40.00

Slope zones that follow the surface contours using the triangulation 3D Faces



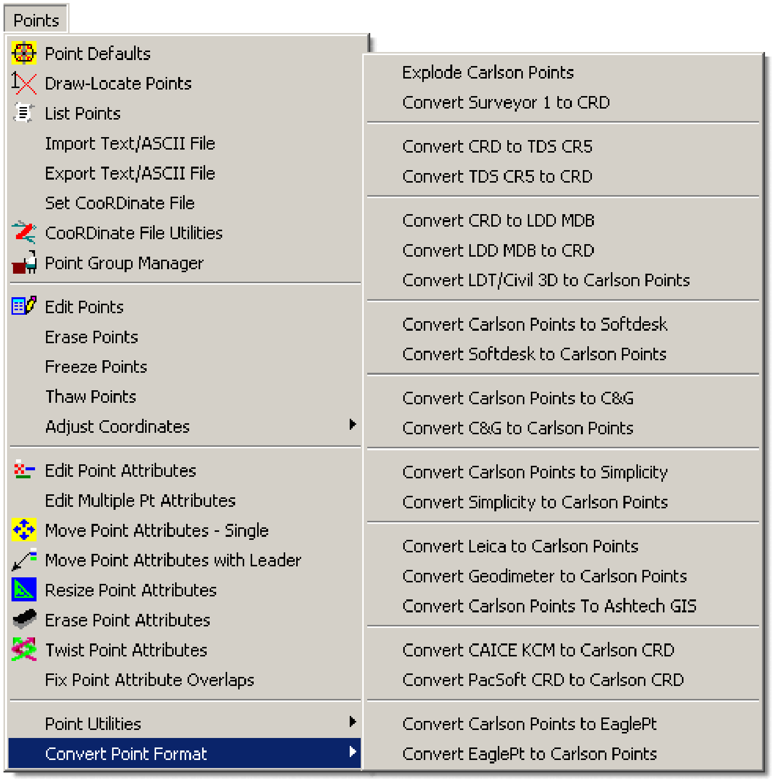
Hatched slope zone contours created from the grid 3D Fac

Pulldown Menu Location: Surface >> Slope Analysis
Keyboard Command: szone
Prerequisite: Surface model file (.TIN, .GRD, or .FLT), or 3D Faces entities

Points Menu 14

All of the routines in this menu operate on points in a Carlson coordinate (.CRD) file. Coordinate files are binary files that contain point numbers, northings, eastings, elevations and descriptions. The Carlson coordinate database (.CRDB) is based on SQLite and supports point numbers and descriptions up to 255 characters. Alternately, C&G CRD and CGC files, LandDesktop MDB files or Simplicity Systems ZAK files can be used in place of the Carlson CRD file. All routines in this menu will read from, and write to, these types of point data files. At any given time, there can only be one active coordinate file. If a command is initiated that requires a coordinate file while one is not one set, Carlson will prompt for a coordinate file name. From that point on, this is the current coordinate file. Another coordinate file can be used by choosing Set Coordinate File or *Open CRD File* in Coordinate File Utilities.

Whenever you asked for point numbers, you can enter any combination with commas and dashes or type **ALL** to use all points. For example 1-3,7,20-23 would act on points 1,2,3,7,20,21,22,23. Coordinate files have either numeric or alphanumeric point numbers. Alphanumeric point numbers consist of nine or less digits and letters (*i.e.* point# 7A). The type of point number format is set when the coordinate file is created. This setting is found under *General Settings* in Carlson Configure. This setting only affects new coordinate files.


Points
Point Defaults
Draw-Locate Points
List Points
Import Text/ASCII File
Export Text/ASCII File
Set CooRDinate File
CooRDinate File Utilities
Point Group Manager
Edit Points
Erase Points
Freeze Points
Thaw Points
Adjust Coordinates
Edit Point Attributes
Edit Multiple Pt Attributes
Move Point Attributes - Single
Move Point Attributes with Leader
Resize Point Attributes
Erase Point Attributes
Twist Point Attributes
Fix Point Attribute Overlaps
Point Utilities
Convert Point Format
Explode Carlson Points
Convert Surveyor 1 to CRD
Convert CRD to TDS CR5
Convert TDS CR5 to CRD
Convert CRD to LDD MDB
Convert LDD MDB to CRD
Convert LDT/Civil 3D to Carlson Points
Convert Carlson Points to Softdesk
Convert Softdesk to Carlson Points
Convert Carlson Points to C&G
Convert C&G to Carlson Points
Convert Carlson Points to Simplicity
Convert Simplicity to Carlson Points
Convert Leica to Carlson Points
Convert Geodimeter to Carlson Points
Convert Carlson Points To Ashtech GIS
Convert CAICE KCM to Carlson CRD
Convert PacSoft CRD to Carlson CRD
Convert Carlson Points to EaglePt
Convert EaglePt to Carlson Points

Each point is drawn by three entities:

1. point block
2. point node
3. symbol

The point block is an INSERT entity with PNTNO, PNTELEV and PNTDESC attributes. These attributes represent the point number, elevation and description respectively. The point node is a POINT entity and is used for picking the point with the NODE snap. The point node is also used as the X, Y, Z coordinate in Triangulate & Contour. The symbol can be any symbol defined in the Symbol Library (use SPT0 for no symbol). Since points use Carlson point symbols, the CAD system variables PDMODE and PDSIZE should usually be set to 0.

The points in the drawing can be linked to their coordinates in the coordinate file. The link updates the coordinate file when a point is modified in the drawing. For example, when points are moved with the Rotate Points command, their coordinates will be automatically updated in the coordinate file. To update the coordinate file without this automatic link, you can run the command *Update CRD File from Drawing* in Coordinate File Utilities. The linking option is called *Link Points with Coordinate File* (currently only available in AutoCAD) and can be set under *General Settings* in Carlson Configure. This setting does not affect points currently in your drawing, only points drawn after you change this setting.

Each point in the coordinate file has room for a 32 character description. To have a longer description, an associated point note file can be used. The note file has the same file name as the coordinate file with a .NOT extension and is stored in the same directory as the coordinate file. For example, **survey.not** would be the note file for **survey.crd**. The note file is a text file that stores a point number together with the additional notes for the point. There is no limit to the length of the note. Notes can be added to points using the Edit Points command. The List Points command can be used to print out the notes.

For each point, the point attribute block, node, and symbol can be bound together into a "grouped" entity. This means that if you choose to use the Move command (or other CAD tools) the entire collection moves together. This is done using the grouping functionality.

To disable this system altogether, navigate to Carlson Configure > General Settings and turn off the toggle for *Group Point Entities*. If you need to temporarily disable grouping in a drawing, you can use the AutoCAD toggle for grouping, which is *Ctrl-A* (holding down the 'Ctrl' key and then pressing the letter 'A' on the keyboard activates this two way toggle and the current status will be echoed to the Command prompt area).

Carlson points include additional information on each element that makes up the point collection (attribute block, node and symbol). This information allows Carlson to know such things as which coordinate (.CRD) the point came from. Commands like Drawing Inspector can then display the point information for the point entities. This also makes it easier for Carlson to identify which drawing objects belong to a point, making commands like Edit Point Attributes a "double-click" pick association instead of a selection set.

Point Defaults

This command sets Carlson point options.

Descriptions: Specify whether you are prompted for a point description when creating points and whether the point descriptions are labeled in the point block.

Elevations: Specify whether you are prompted for a point elevations when creating points and whether the point elevations are labeled in the point block.

Locate on Real Z Axis: When checked, points are located at their actual elevation, otherwise points will be located zero elevation.

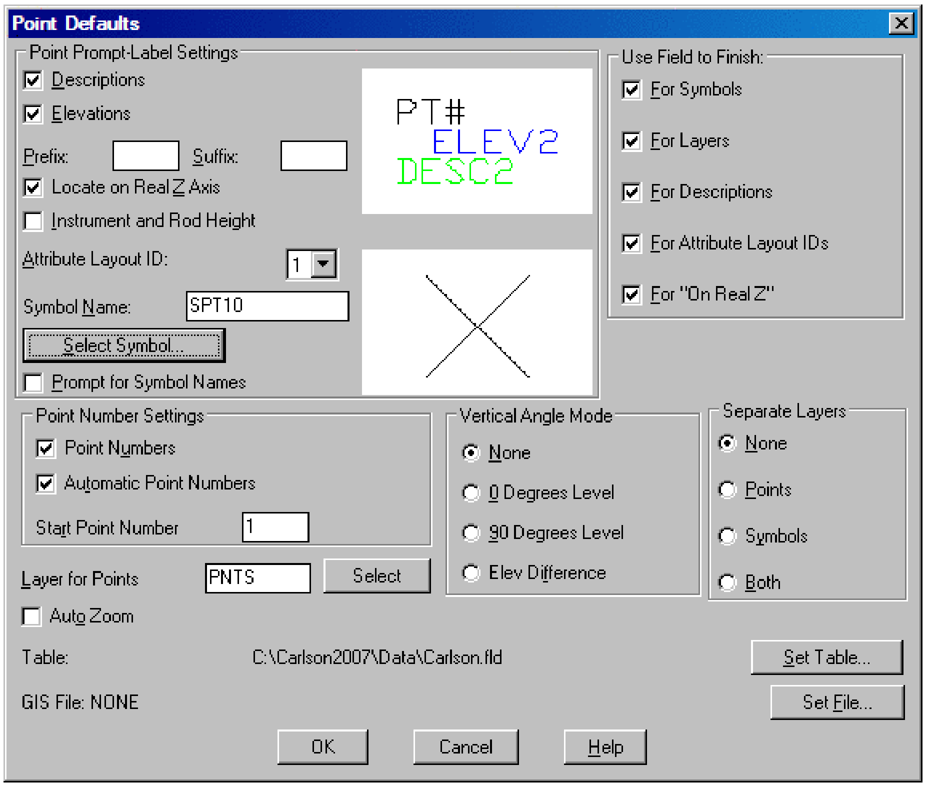
Attribute Layout ID: Controls the location of the point number, elevation and description. These attribute layouts are defined in drawings that are stored in the Carlson SUP directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then open and edit the associated SRVPNO drawing.

Symbol Name: Enter the default symbol name to use. You may also pick the Select Symbol button to select a symbol from the symbol library.

Prompt for Symbol Names: When checked, you will be prompted for each symbol name instead of using the default symbol.

Point Numbers: When this toggle is OFF, no point number will be created and no points will be stored in the coordinate (.CRD) file.

Automatic Point Numbers: When this toggle is OFF, commands that locate a point will prompt for a point number. Otherwise, point numbers are numbered sequentially. If the Start Point Number field is set to 0, no point will be plotted. An exception to this is when you use the *Draw-Locate Points* command and use the Range option, then a point entity is plotted.



Point Defaults

Point Prompt-Label Settings

☑ Descriptions

☑ Elevations

Prefix: Suffix:

☑ Locate on Real Z Axis

☐ Instrument and Rod Height

Attribute Layout ID: 1

Symbol Name: SPT10

☐ Prompt for Symbol Names

Use Field to Finish:

☑ For Symbols

☑ For Layers

☑ For Descriptions

☑ For Attribute Layout IDs

☑ For "On Real Z"

Point Number Settings

☑ Point Numbers

☑ Automatic Point Numbers

Start Point Number 1

Layer for Points PNTS

Vertical Angle Mode

● None

○ 0 Degrees Level

○ 90 Degrees Level

○ Elev Difference

Separate Layers

● None

○ Points

○ Symbols

○ Both

☐ Auto Zoom

Table: C:\Carlson2007\Data\Carlson.fld

GIS File: NONE

The following table illustrates the effects of elevation settings:

```
Elevations Yes
Real Z No
Picked Point  Labels point, Prompts for elevation, uses 0 for z coordinate
Point Number  Labels point, No Prompt, uses 0 for z coordinate
```

```
Elevations Yes
Real Z Yes
Picked Point  Labels point, Prompts for elevation for z coordinate
Point Number  Labels point, No Prompt, uses z coordinate from file
```

```
Elevations No
Real Z No
Picked Point  No Label, No Prompt, uses 0 for z coordinate
Point Number  No Label, No Prompt, uses 0 for z coordinate
```

```
Elevations No
Real Z Yes
Picked Point  Labels point, No Prompt, uses z coordinate of picked point
Point Number  Labels point, No Prompt, uses z coordinate from file
```

Start Point Number: Specify the next point number to use.

Vertical Angle Mode: Specify how Carlson should prompt you for vertical angles. None means no prompt. Applies to creating points with commands such as *Traverse.* The vertical angle is used to calculate the point elevation.

Separate Layers: Specify settings for point attribute layers.

None: The point symbol, point number, elevation and description use the layer names PNTMARK, PNTNO, PNTELEV and PNTDESC.

Points: The point number, elevation and description layers are composed by concatenating the point layer and the string NO, ELEV, and DESC respectively. For example, if the point layer is UTIL then the attribute layers will be UTILNO, UTILELEV and UTILDESC.

Symbols: The point symbol layer is composed by concatenating the point layer and the string MARK. For example, if the point layer is UTIL then the symbol layer will be UTILMARK.

Both: The point symbol, point number, elevation and description layers are composed by concatenating the point layer and the string MARK, NO, ELEV, and DESC respectively. For example, if the point layer is UTIL then the symbol/attribute layers will be UTILMARK, UTILNO, UTILELEV and UTILDESC.

Layer for Points: Specify the layer name for Carlson points.

Auto Zoom: When checked, the drawing will perform a Zoom—Center around new points to keep the display centered around current working area. This only applies during commands such as Traverse. This setting is also available in *Configure* under General Settings where it is called Auto Zoom Center for New Points.

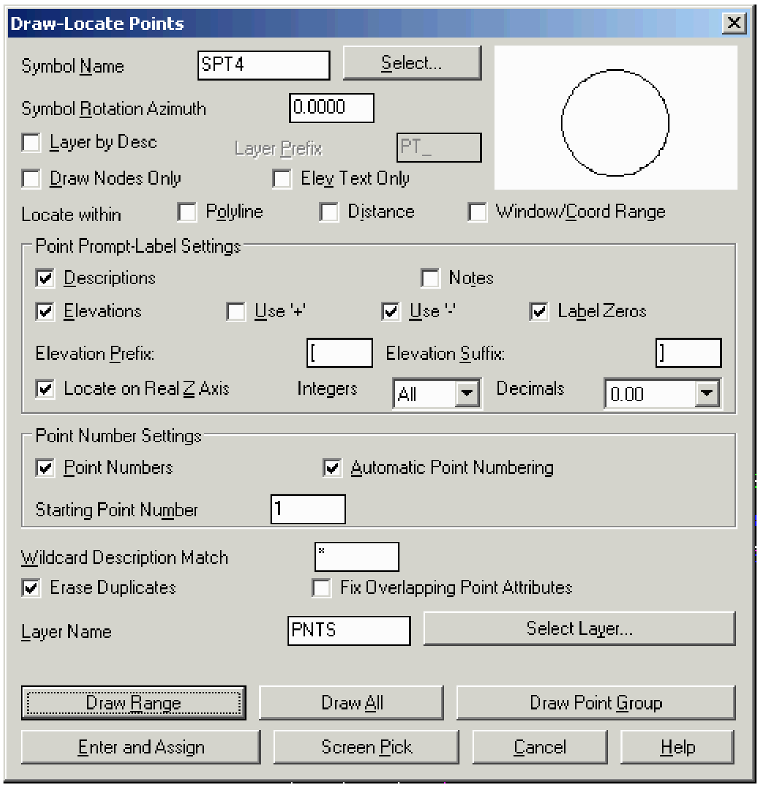
Use Field to Finish For: Allows you to use the code definitions from Field to Finish for the Point Symbols, Layers, Descriptions, Attribute Layout IDs and whether to locate the point on the "Real Z" and whether to Separate Attribute Layers when creating new points. For example, when creating a point with description "EP", Carlson would look up "EP" in the Field to Finish table and will use the field code definitions to establish the point instead of the definitions defined in Point Defaults.

GIS File: This option lets you specify a GIS file to be used when creating new points. The GIS file contains a list of fields to prompt for. For each point that is created, the program will prompt for these fields and store the results to the note file (.not) associated with the current CRD file.

Pulldown Menu Location: Points
Keyboard Command: ptsetup
Prerequisite: None

Draw-Locate Points

The Draw-Locate Points dialog box allows you to insert either new or existing points into the drawing. You can create new points either by picking points on the screen, or by entering northing and easting coordinates. You can also place existing points by entering point numbers which reference the current coordinate file. You are prompted to choose a coordinate file if no coordinate file is current.



Symbol Name: SPT4
Symbol Rotation Azimuth: 0.0000
☐ Layer by Desc — Layer Prefix: PT_
☐ Draw Nodes Only ☐ Elev Text Only
Locate within ☐ Polyline ☐ Distance ☐ Window/Coord Range

Point Prompt-Label Settings
☑ Descriptions ☐ Notes
☑ Elevations ☐ Use '+' ☑ Use '-' ☑ Label Zeros
Elevation Prefix: [Elevation Suffix:]
☑ Locate on Real Z Axis Integers: All Decimals: 0.00

Point Number Settings
☑ Point Numbers ☑ Automatic Point Numbering
Starting Point Number: 1

Wildcard Description Match: *
☑ Erase Duplicates ☐ Fix Overlapping Point Attributes
Layer Name: PNTS

The name of the symbol file is displayed in **Symbol Name.** You can choose a different symbol by clicking Select. The selected point symbol is displayed on the right.

Symbol Rotation Azimuth is the rotation angle that is used for the point symbols. This angle is used in a counter-clockwise direction relative to the current twist screen.

Layer by Desc inserts the points in the layer named by the point description. Using Layer by Desc organizes the points by description and allows for layer management. For example, you can use the Isolate Layers command to show only points on a certain layer. If you include an invalid layer character in the description, the layer name stops at the bad character. A point description of "UP / 105" would use layer "UP", for example. The Layer Prefix is added to the beginning of the layer name. For example, a Layer Prefix of "PT_" and a point with the description "EP" would use the layer "PT_EP". Layer Prefix is optional. It allows all the point layers to be grouped.

Draw Nodes Only inserts only a point entity (the node) and not the point block and symbol. This option is most useful when you have a lot of points to insert, because inserting only the nodes is faster than inserting nodes with the point block and symbol. Commands such as Triangulate & Contour and Make 3D Grid File can use these points, and do not need the point block and symbol.

Selecting **Elev Text Only** draws text of the point elevation without the point block, symbol, or node. The decimal place of elevation text is placed at the northing and easting point location.

Locate within Polyline inserts only the points that are inside a closed inclusion polyline. The command prompts you to select a closed inclusion polyline and as well as an optional exclusion polyline. All the points in the current coordinate file are checked. Any points that are located within the inclusion polyline and outside the exclusion polyline are drawn.

Locate within Distance inserts only the points that are within a specified distance from a reference point. The command asks you for the reference point and the search distance. All the points in the current coordinate file are checked. Any points that are located within the search distance of the reference point are drawn.

Locate within Window/Coord Range inserts only the points that are within the specified window or range of northing, easting, and elevation. The command prompts for the minimum and maximum northing, easting, and elevations. These values default to the actual minimum and maximum in the coordinate file. Then the command prompts for the point number range of points to check. The points that fall in both the point number range and the coordinate range are drawn.

Under **Point Prompt-Label Settings**, you determine attributes for which you will be prompted.

Descriptions determines whether you are prompted for descriptions for each point when creating new points. When you are placing both new and existing points, Descriptions determine whether this attribute is labeled with the point inserts.

Notes works with the note file (.not) associated with the current coordinate file. The note file contains unlimited point descriptions in addition to the fixed 32-character point descriptions in the coordinate file. When you create points with Notes on, the command will prompt for point notes to be stored with the point. When you draw existing points with Notes on, any notes for the points are drawn as text entities below the point description.

Elevations determines whether you are prompted for elevations for each point when creating new points. When you are placing both new and existing points, Elevations determine whether this attribute is labeled with the point inserts.

Use '+' labels the positive elevations with a leading '+'. For example, "+159.43".

Use '-' labels the negative elevations with a leading '-'.

Locate on Real Z Axis determines if the points are placed at their elevations or at zero elevation.

Label Zeros will label points with zero elevation when the Elevations option is on. Otherwise only points with nonzero elevation will be labeled.

Elevation Prefix/Suffix set the prefix and suffix labels to apply for the elevation labels.

Elevation Integers controls the number of digits to display to the left of the decimal point for the elevation label. The All setting will show the full elevation digits. The other settings allow you to limit the number of digits to display for the purpose of reducing the amount of space the elevation labels take up in the drawing. For example, if a site is in the 4000 foot elevation range, then this setting could be set to three digits (000) and an elevation of 4321 would be labeled as 321.

Elevation Decimals sets the number of decimals to the right of the decimal places for the elevation labels.

Under **Point Number Settings**, you determine how points will be numbered.

Point Numbers determines whether the complete point block is drawn or just the symbol and node. When you create new points with Point Numbers off, no points are stored in the current coordinate file, and only the point symbol and node are drawn. When you draw existing points with Point Numbers off, the point attribute block is not drawn and only the point symbol and node are drawn.

Automatic Point Numbering applies to creating new points. With this option active, the command will use the **Starting Point Number** for the first new point. The next point number is automatically incremented. Before storing the point, the command checks whether the point number is used. If the point number is used and point protect is on (set in the Coordinate File Utilities command), then the command will prompt for another point number or to overwrite the point. With Automatic Point Numbering off, the command will prompt for the point numbers.

Determine how the points are to be displayed and in what layer.

With **Wildcard match of pt description**, you can display only points with specific descriptions. This can be thought of as a filter. For example, entering IP would display only points that are labeled with the description IP, or Iron Pin. The default is the asterisk (∗). This will display all points regardless of description.

Layer Name allows you to designate a layer for the points to be displayed. You can enter a new name, CLAYER, or choose an existing layer by clicking **Select Layer**. Entry of CLAYER selects the current layer. A Carlson Survey point consists of a block insert with attributes, a point symbol, and a point entity. The point entity is used for picking the point by OSNAP Node in other commands. The block insert includes a point number, elevation, and description. These attributes are in the PNTMARK, PNTNO, PNTELEV, and PNTDESC layers. The points are also in an overall layer as specified in this dialog box. This layer setup allows you to freeze a group of points by the main layer name or freeze point attributes for all the points in the drawing. For example, freezing layer "PNTS" would freeze all the points in this layer. Freezing layer "PNTELEV" would freeze the point elevation attribute for all the points.

The **Erase Duplicates** option will erase existing point entities that match the point numbers currently being drawn.

Fix Overlapping Point Attributes will detect point number, elevation and description attributes that overlap with other points. Rules can be applied to rearrange the point attributes to avoid the overlaps. A point overlap manager then steps through each overlap for review or manually moving the attributes.

Draw Range will draw existing points from the current coordinate file. The Draw Range button will prompt for the point numbers to draw.

Draw All will draw all the points in the coordinate file, and then zoom the extents of the display to show the points.

Draw Point Group will draw a point group with settings that are established in the Point Group Manager.

Enter and Assign can be used to create new points using the point northing and easting. When a grid projection is defined in Drawing Setup, then there is an option to enter the points using latitude/longitude.

Screen Pick allows you to create points by picking the point coordinate on the screen. For example, you could set the Object Snap to EndPoint and pick the end point of a building polyline to create a point at the building corner.

Prompts

To create a new point:
Draw-Locate dialog *choose Screen Pick*
Pick point to create: *pick a point*
Select/<Enter Point Elevation <0.00>: *Enter elevation* Press S to select text to set elevation.
Enter Point Description <>: *Enter*
N: 5106.57 E: 4901.96 Z: 0.00
Enter/<Select text of elevation>: Select text entity that defines elevation of point.

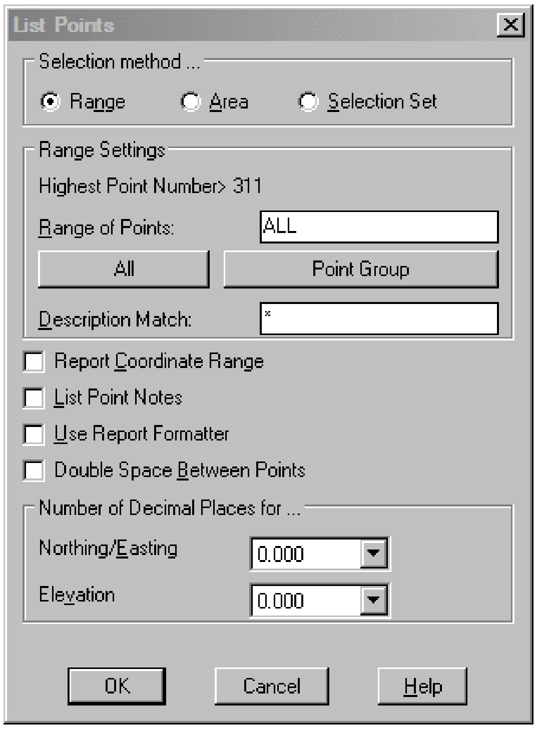
To locate a point in the coordinate file (point number 3 in this example):
Draw-Locate Point dialog *choose Draw Range*
Point numbers to draw: *3*
Points Drawn> 1
Locates point 3.
Point numbers to draw: *1-2*
Points Drawn> 2

Locates a range of points. From 1 to 2.
Point numbers to draw: *Enter*

Keyboard Command: lpoint
Prerequisite: A CRD file and you may want to execute *Drawing Setup* (see the Setting menu) to set the scale and size.

List Points

This command generates a report of point numbers, northings, eastings, elevations and descriptions.



List Points

Selection method ...

● Range ○ Area ○ Selection Set

Range Settings

Highest Point Number> 311

Range of Points: ALL

Description Match: *

☐ Report Coordinate Range
☐ List Point Notes
☐ Use Report Formatter
☐ Double Space Between Points

Number of Decimal Places for ...

Northing/Easting: 0.000

Elevation: 0.000

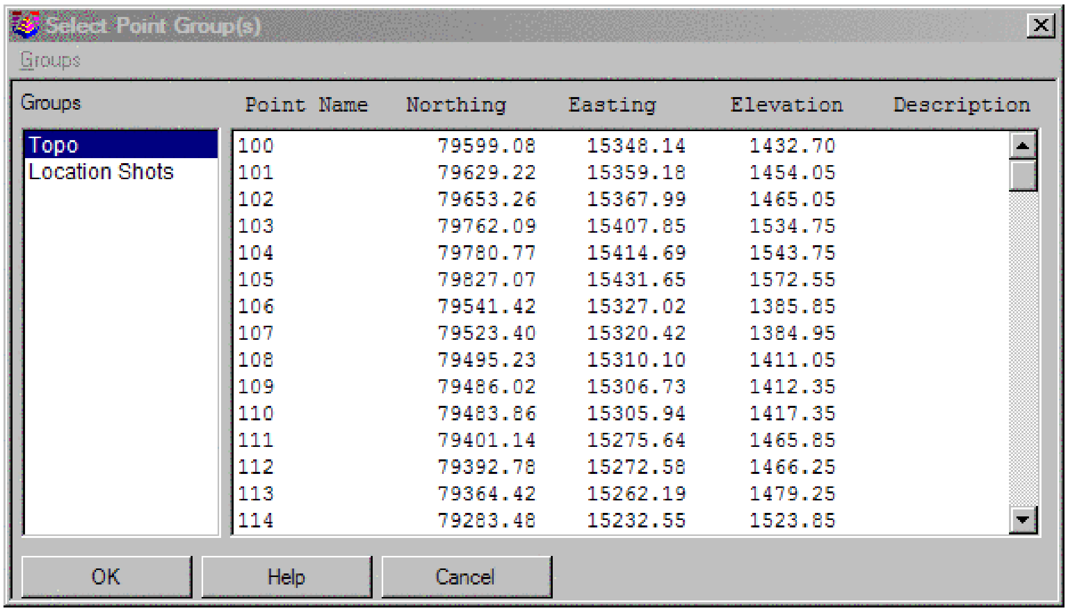
Selection Method-Range allows you to specify the points to list by point number range

Selection Method-Area allows you to select a closed polyline to list all of the points inside of that polyline.

Selection Method-Selection Set allows you to specify the points to list by selecting them from the drawing.

Range of Points: If you are using the Range method, specify the range of points to list here. To quickly specify all points, click the **All** button.

Point Group allows for the selection of a specified group or multiple groups for listing. Standard windows selection tools, ctrl and shift keys, can be utilized for selecting groups.



Point Name	Northing	Easting	Elevation	Description
100	79599.08	15348.14	1432.70	
101	79629.22	15359.18	1454.05	
102	79653.26	15367.99	1465.05	
103	79762.09	15407.85	1534.75	
104	79780.77	15414.69	1543.75	
105	79827.07	15431.65	1572.55	
106	79541.42	15327.02	1385.85	
107	79523.40	15320.42	1384.95	
108	79495.23	15310.10	1411.05	
109	79486.02	15306.73	1412.35	
110	79483.86	15305.94	1417.35	
111	79401.14	15275.64	1465.85	
112	79392.78	15272.58	1466.25	
113	79364.42	15262.19	1479.25	
114	79283.48	15232.55	1523.85	

Description Match: Can be used to filter the point list. For example, entering "EP" for the Description Match would only list those points with a description of "EP". An asterisk (∗) is the default setting, it matches any character sequence, meaning no filtering occurs.

Report Coordinate Range: When checked, the point list will include the minimum and maximum northing, easting and elevation.

List Point Notes: When checked, any additional point notes assigned to the points will be included in the point list. Point notes can be entered using the *Input-Edit Point* command found in *Coordinate File Utilities*.

Use Report Formatter: When checked, you may customize the fields and layout of the point report using the Report Formatter. The Report Formatter can also be used to export the point report to Excel or Access.

Double Space Between Points: When checked, the report will be double spaced.

The point list report is displayed in the Standard Report Viewer which can print, draw and save the report file. This report viewer cannot be used to edit the coordinate file. Instead use the *Edit Points* command in the Points menu.

Example of List Points Report:

```
List Points Report
File> C:\Carlson2008\DATA\POINTS.CRD
Job Description>
Job Number> 0.000 Job Date> 06/01/2002
PointNo. Northing(Y) Easting(X) Elev(Z) Description
1        5355.240    5000.000   91.8    CP2
2        5000.000    5000.000   90.0    CP2
1000     5355.236    5000.000   91.8    CK
1001     4941.911    4622.029   91.4    FPC
1002     4952.629    4642.818   90.6    FH
1003     4959.931    4634.440   89.8    TOE1
```

Pulldown Menu Location: Points
Keyboard Command: listpt
Prerequisite: Points in a coordinate file or on the screen

Import Text/ASCII File

This command converts point data from an ASCII text file into the current Carlson coordinate (.CRD) file. Each line of the text file can contain any combination of point number, northing, easting, elevation and description. All point information should be on one line with the values separated by a comma, space or other delimiter. Under the Source File Format setting you can choose from some specific formats or User-Defined. For User-Defined, the format of the text file is specified in the Coordinate Order field where the value identifiers are listed with the appropriate delimiters. For example:

For a text file with northing, easting, elevation and comma delimiters:
5100.0,5150.5,485.1
5127.1,5190.3,487.3
The Coordinate Order would be:
Y,X,Z

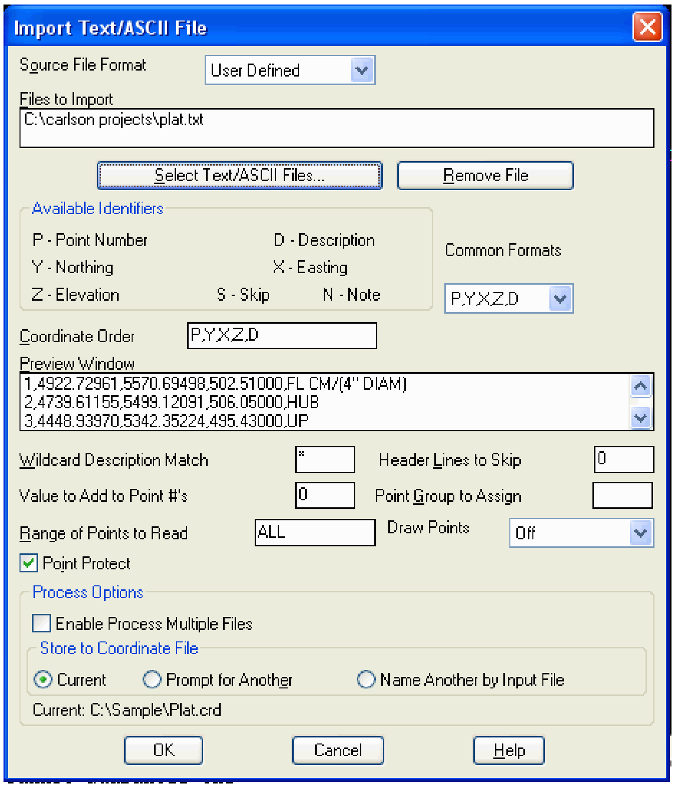
For a text file with point number, easting, northing, elevation, description and space delimiters:
1 5000.0 5000.0 490.3 TRAV
2 5030.4 4930.5 495.5 TRAV
The Coordinate Order would be:
P X Y Z D

Common formats can be selected from the Common Format List. All the lines in the text file should contain only point data and any header lines should be removed. To read the text file, pick the Select Text/ASCII File button and choose the file to read. Then the selected file is displayed in the Preview Window to help with filling out the Coordinate Order. When the Coordinate Order is set, click OK to read the text file. The Wild Card Descriptions Match allows for only point with matching descriptions to be imported. With Point Protect active, the program will check if a point number already exists in the CRD before importing the point. If a point conflict is found, you can either assign a new point number or overwrite the old point. The Value to Add to Point Numbers allows you to renumber the points as they are imported. The Header Lines to Skip value is the number of lines not to be processed at the start of the text file. The Point Group To Assign option will create a point group with the specified name for the coordinate file containing the point numbers imported with Import Text/ASCII File.

Multiple files can be imported at once. To do this, toggle on the Enable Process Multiple Files option. After selecting the Text/ASCII Files button, you can select multiple files by using the Shift or Ctrl keys while picking files. You can also run Select Text/ASCII Files multiple times allowing for selection of files located in different locations. The files to import are listed in the top scroll display window. The point data from all the import files can be stored to the current CRD file or to separate files for each import file. The separate file option will name the resulting CRD files with the same name as the import file with a .CRD file extension. For example, the import file job125.txt would create job125.crd. The CRD file will be created in the same location as that of the selected text file to import.

Under Process Options, there are choices for selecting the coordinate file to store the imported points. The Current option uses the current coordinate file that is active in the drawing. This coordinate file name is shown at the bottom of the dialog. The Prompt For Another option uses the standard file selection dialog to select the file. The Name Another By Input File uses a coordinate file name with the same name as the input file except for a file extension of .CRD.

The special formats of Leica .d45/.gsi/.raw files, TDS .cr5 files, Topobase .ro files, Geodimeter .obs/.raw/.are files, Laser Atlanta .txt files, Trimble .pos files, Zeiss .txt files, Traverse PC .trv files, Maptech, Benchmark .dat files, CAICE/Caltrans .tss files, NLS MMH360 .360 files, EMXS .xng files, and Cadvantage .cog files can be directly imported by choosing that File Format at the top of the dialog.


Import Text/ASCII File
Select Text/ASCII Files...
Remove File
OK
Cancel
Help

Source File Format: User Defined

Files to Import: C:\carlson projects\plat.txt

Available Identifiers

P - Point Number	D - Description
Y - Northing	X - Easting
Z - Elevation	S - Skip N - Note

Common Formats: P,Y,X,Z,D

Coordinate Order: P,Y,X,Z,D

Preview Window

```
1,4922.72961,5570.69498,502.51000,FL CM/(4" DIAM)
2,4739.61155,5499.12091,506.05000,HUB
3,4448.93970,5342.35224,495.43000,UP
```

Wildcard Description Match: *

Header Lines to Skip: 0

Value to Add to Point #'s: 0

Point Group to Assign:

Range of Points to Read: ALL

Draw Points: Off

☑ Point Protect

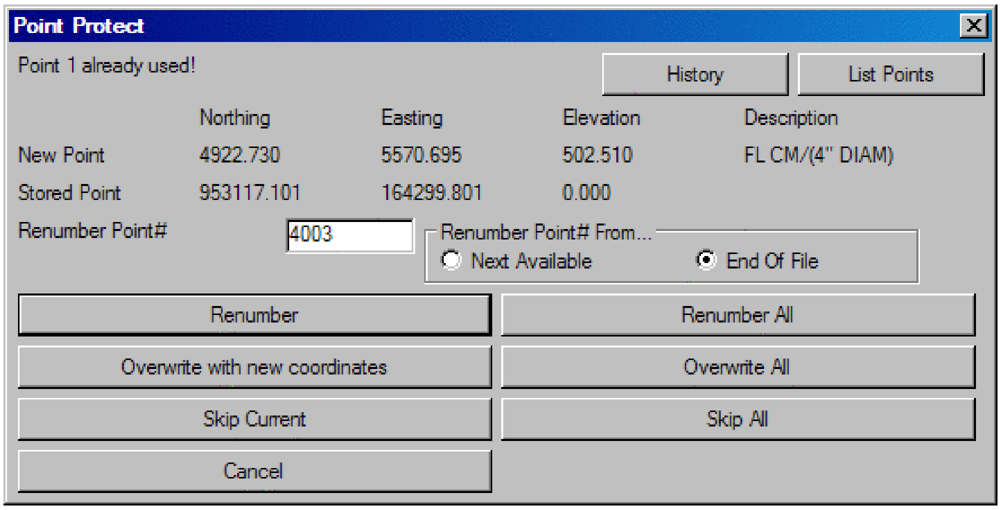
Process Options

☐ Enable Process Multiple Files

Store to Coordinate File

● Current ○ Prompt for Another ○ Name Another by Input File

Current: C:\Sample\Plat.crd


Point Protect
History
List Points
Renumber
Renumber All
Overwrite with new coordinates
Overwrite All
Skip Current
Skip All
Cancel

Point 1 already used!

	Northing	Easting	Elevation	Description
New Point	4922.730	5570.695	502.510	FL CM/(4" DIAM)
Stored Point	953117.101	164299.801	0.000	

Renumber Point#: 4003

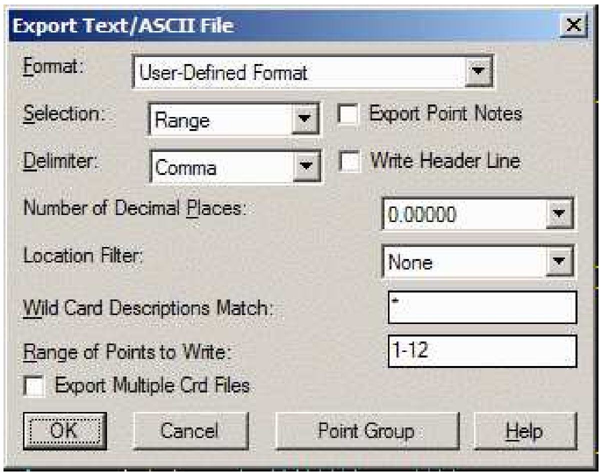
Renumber Point# From...

○ Next Available ● End Of File

Pulldown Menu Location: Points
Keyboard Command: readpt
Prerequisite: A text file to read

Export Text/ASCII File

This command outputs point data from the current Carlson coordinate file to an ASCII text file formatted according to a variety of options presented in the form of a general dialog.



Format: User-Defined Format

Selection: Range

☐ Export Point Notes

Delimiter: Comma

☐ Write Header Line

Number of Decimal Places: 0.00000

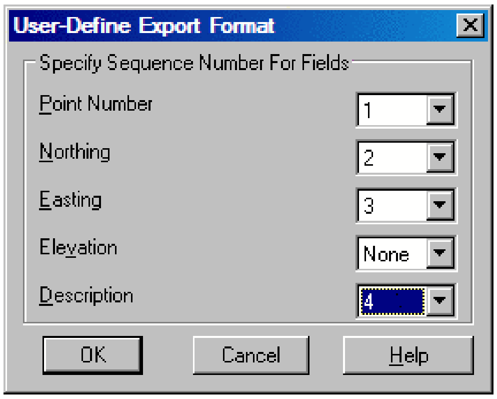
Location Filter: None

Wild Card Descriptions Match: *

Range of Points to Write: 1-12

☐ Export Multiple Crd Files

Format. Specify the type of file to write from the drop down list. There are several variations on point number, northing, easting, elevation and descriptions as well as specific formats for Leica, Geodimeter, Zeiss, Maptech, D45, Cadvantage, Multiplane and SDMS CTL formats. In addition there is a User-Defined Format option to define the order of the fields output. When using the User-Defined format, after selecting OK, the User-Define Export Format dialog will appear. On this dialog, specify the order of the fields by defining a number sequence in each field. You can skip fields and omit data in the output file by leaving None in the sequence field for this data:



Point Number: 1

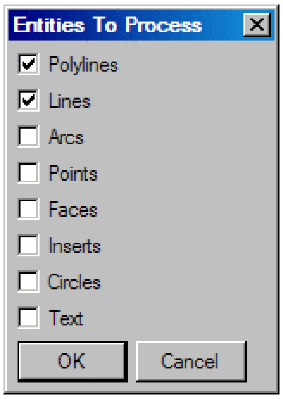
Northing: 2

Easting: 3

Elevation: None

Description: 4

Selection. There are three Selection Methods provided for the data to export. Notes associated with the points may be included in the export by enabling the check box. Specify either Range, Screen Points or Screen Entities in the Selection Field. A Range selection is a user specified range such as 1-10,30-50. A Screen Points selection is made by selecting points from the screen area. The Screen Entities option allows for selection of polylines, lines, arcs, points, faces, inserts and text to export point data from. When the Screen Entities option is selected, the following dialog box will display allowing for the specification of the type of entity to export data from:



☑ Polylines

☑ Lines

☐ Arcs

☐ Points

☐ Faces

☐ Inserts

☐ Circles

☐ Text

Delimiter. Select the desired field delimiter of the export file as either Comma or Space from the drop down list. If a header line is to be included, enable the check box.

Number of Decimal Places. Select the desired number of digits to be included in the mantissa of all output ordinates.

Location Filter. Choose from filter methods of within inclusion perimeter polyline, by coordinate window or center within radius from a center point.

Wild Card Descriptions Match. A description filter is also available for exporting only points from the range or selection set with certain descriptions.

Export Multiple Crd Files. Enable this check box to specify multiple CRD files to apply the selection criteria against. If enabled, an additional dialog will be presented from which you can browse, select, and remove as many CRD files as desired.

Point Group. Displays the Point Group manager dialog from which you may define, modify, and select one or more Point Groups to define the points to be included in the export.

After selecting the OK button, a final dialog appears that allows you to specify a new file or to append data into an existing file. The standard file selection dialog allows you to specify the export file name.

Pulldown Menu Location: Points
Keyboard Command: writept
Prerequisite: A Coordinate File (.CRD)

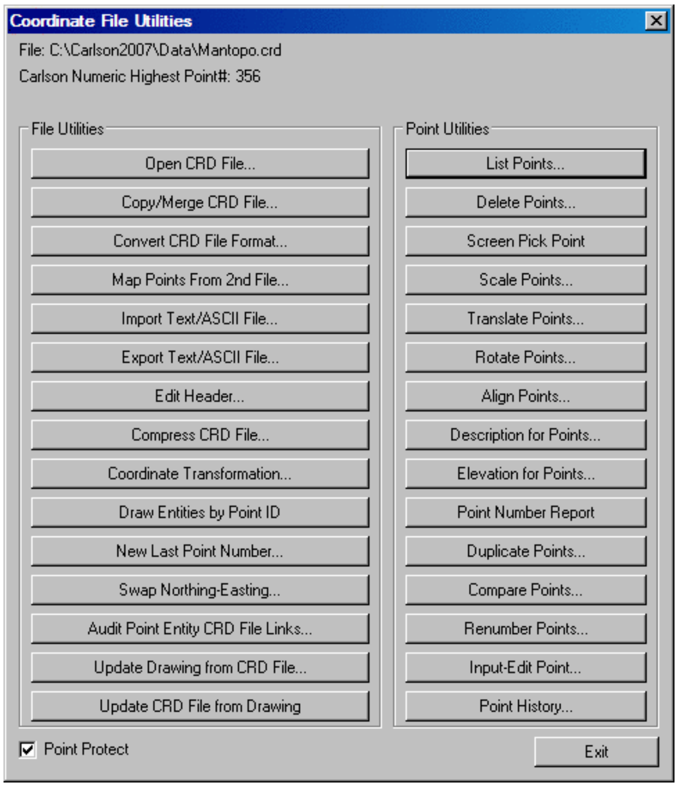
CooRDinate File Utilities

This command allows you to manipulate the coordinates stored in a coordinate (.CRD) file. One of the most important commands is the Update CRD File from Drawing which allows you to update the file after editing the drawing with commands such as *Erase*, *Move, Rotate* or *Change Elevations*. Another handy option is the *Draw Entities by Point Number* which allows the user to input point number ranges and plot Lines, Arcs, Polylines or 3D polylines. Coordinate files have either numeric or alphanumeric point numbers. Alphanumeric point numbers consist of nine or less digits and letters (i.e. point number 7A). The type of point number format is displayed at the top title bar of the main dialog. Another coordinate format is the Carlson coordinate database (.CRDB) which is based on SQLite and supports point numbers and descriptions up to 255 characters.

In addition to running the routines through the dialog, many routines have command names that you can enter at the Command: prompt, create a Quick Key, or put into a toolbar. Here are these command names and their corresponding dialog button names:

setcrd: Open CRD File
listpt: List Points
delpt: Delete Points
readpt: Import Text/ASCII File
writept: Export Text/ASCII File
scalept: Scale Points
transpt: Translate Points
rotatept: Rotate Points
alignpt: Align Points
cfuelev: Elevation for Points

cfureport: Point Number Report
cfuduplicate: Duplicate Points
cfucompare: Compare Points
cfuhistory: Point History
cfucopy: Copy/Merge CRD File
cfuupdatedwg: Update Drawing from CRD File
cfuupdatecrd: Update CRD File from Drawing
cfudesc: Description for Points
cfutransform: Coordinate Transformation

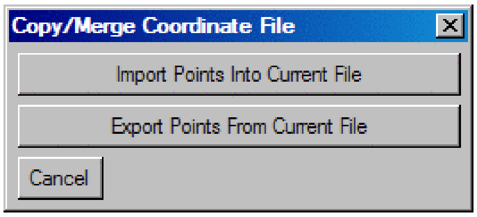

File: C:\Carlson2007\Data\Mantopo.crd
Carlson Numeric Highest Point#: 356

☑ Point Protect

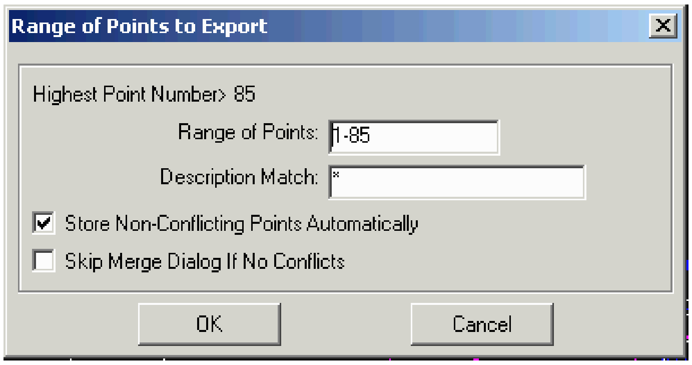
Coordinate File Utilities
File Utilities
Open CRD File...
Copy/Merge CRD File...
Convert CRD File Format...
Map Points From 2nd File...
Import Text/ASCII File...
Export Text/ASCII File...
Edit Header...
Compress CRD File...
Coordinate Transformation...
Draw Entities by Point ID
New Last Point Number...
Swap Northing-Easting...
Audit Point Entity CRD File Links...
Update Drawing from CRD File...
Update CRD File from Drawing
Point Utilities
List Points...
Delete Points...
Screen Pick Point
Scale Points...
Translate Points...
Rotate Points...
Align Points...
Description for Points...
Elevation for Points...
Point Number Report
Duplicate Points...
Compare Points...
Renumber Points...
Input-Edit Point...
Point History...
Exit

Open CRD File: Allows the user to switch to another file. When you exit Coordinate File Utilities this will be the current file that you work with in Carlson.

Copy/Merge CRD File: This command allows for the copying of entire CRD files, or parts of CRD files, to a new or existing files. This can be used to make a backup of your coordinate file, and it can also be very valuable in coordinate file manipulation. For example, if a certain range of points from one CRD file was also required in the active CRD file, this command would be used to simply copy the required range into the active CRD file. There are two options when first executing the command. These options are whether to import points from another file to the current (active) CRD file, or to export the current (active) coordinate file to another file.


Copy/Merge Coordinate File
Import Points Into Current File
Export Points From Current File
Cancel

Once this option has been decided, a prompt for the file to copy From or TO, will be displayed. Here simply specify the correct file.



Highest Point Number> 85

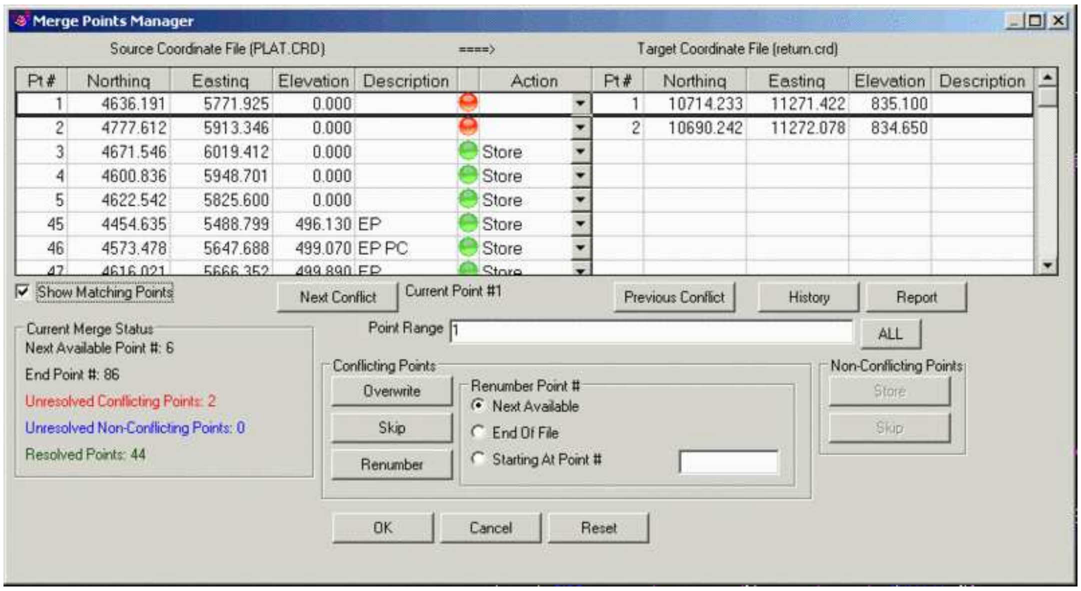
Range of Points: 1-85

Description Match: *

☑ Store Non-Conflicting Points Automatically

☐ Skip Merge Dialog If No Conflicts

Next there's a dialog to specify the range of points to transfer and some options. Here specify the points to copy. Point numbers and ranges can be entered together, for example, 1-3,10,15 would result in points 1 through 3 and points 10 and 15 being copied. The Description Match can be used to filter the points to transfer only the points with matching description. The default of $*$ will transfer all the points in the range. The Store Non-Conflicting Point Automatically will set the transfer action as Store for all transfer points that don't have a point protect conflict. The Skip Merge Dialog If No Conflicts will skip the next dialog when there are no point protect conflicts.



Source Coordinate File (PLAT.CRD) ====> Target Coordinate File (return.crd)

Pt#	Northing	Easting	Elevation	Description		Action	Pt#	Northing	Easting	Elevation	Description
1	4636.191	5771.925	0.000		🔴		1	10714.233	11271.422	835.100	
2	4777.612	5913.346	0.000		🔴		2	10690.242	11272.078	834.650	
3	4671.546	6019.412	0.000		🟢	Store					
4	4600.836	5948.701	0.000		🟢	Store					
5	4622.542	5825.600	0.000		🟢	Store					
45	4454.635	5488.799	496.130	EP	🟢	Store					
46	4573.478	5647.688	499.070	EP PC	🟢	Store					
47	4616.021	5666.352	499.890	EP	🟢	Store					

☑ Show Matching Points

Current Point #1

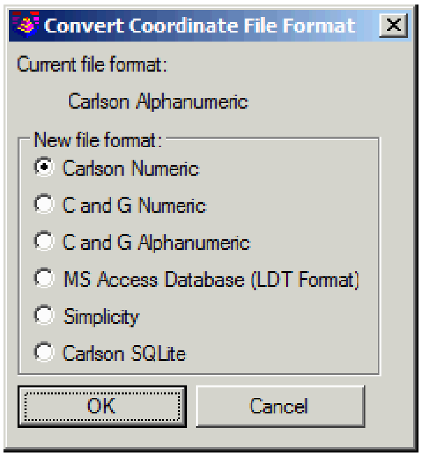
Point Range: 1

Current Merge Status
Next Available Point #: 6
End Point #: 86
Unresolved Conflicting Points: 2
Unresolved Non-Conflicting Points: 0
Resolved Points: 44

Renumber Point #
● Next Available
○ End Of File
○ Starting At Point #

Next there's the Merge Points Manager dialog that shows the Source Coordinate File on the left (where the point data is being copied from) and the Target Coordinate File on the right (where the point data is being written to). Conflict cases are when the same point number exists in both files with different coordinates. The action choices for conflicts are to Overwrite, Skip or Renumber. For renumber, you can either renumber with the next available point number in the target file or to the highest point number in the target file plus one. Non-conflict cases are when the source point number does not exist in the target file. The action choices for non-conflicts are to Store or Skip. You can assign actions by picking on the Action field in the spreadsheet or by entering in a Point Range to apply and picking an action button. The Show Matching Points toggle will show points with matching point data in both files. Otherwise only point with differences are shown. The Next Conflict button will highlight the spreadsheet and set the Point Range to the next point that needs an action assigned. Similarly, the Previous Conflict sets focus to a lower point number that needs an action. The History button shows the point history for the selected point. The Report button creates a list points report. The Current Merge Status reports the number of unresolved and resolved points. When all the unresolved points are resolved by assigning actions, you can pick OK.

Convert CRD File Format: This allows you to convert the current CRD file from numeric format to alphanumeric format or vice versa. This routine will also change crd files to and from different software formats. These formats include Carlson SQLite (.CRDB), C&G, Microsoft Access (.MDB) in same format as AutoDesk Land Desktop, and Simplicity (.ZAK). The current format of the active coordinate file will be displayed as well as the options for the new file format. This command only changes the format of the active coordinate file.



Current file format:

Carlson Alphanumeric

New file format:

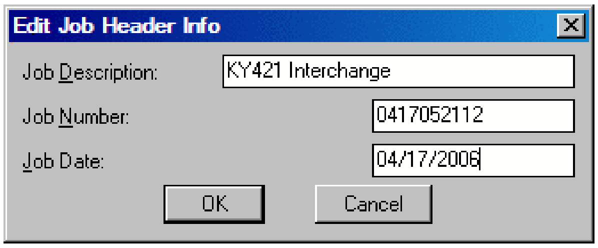
● Carlson Numeric
○ C and G Numeric
○ C and G Alphanumeric
○ MS Access Database (LDT Format)
○ Simplicity
○ Carlson SQLite

Map Points from 2nd File: This routine adds point to the current CRD file from points stored in a second CRD file. The points to copy are specified by numbers one at a time. Prompts for the destination point number (number to create in current crd file) and source point number (point number to be copied from second crd file) will be displayed.

Import Text/ASCII File: This routine converts point data from a text file into the current coordinate (.CRD) file. See the *Import Text/ASCII File* command in this chapter for more information.

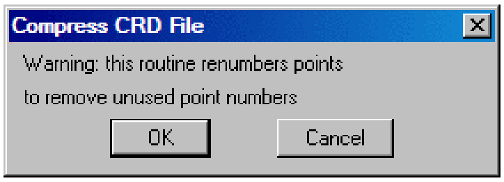
Export Text/ASCII Text File: This routine outputs point data from the current coordinate (.CRD) file to a ASCII Text file. See the *Export Text/ASCII File* command in this chapter for more information.

Edit Header: Enter or edit the job information associated with the coordinate file. The fields include Job Description, Job Number and Job Date. This information will appear on the List Point report. Non-digit characters are not allowed in the Job Number field.



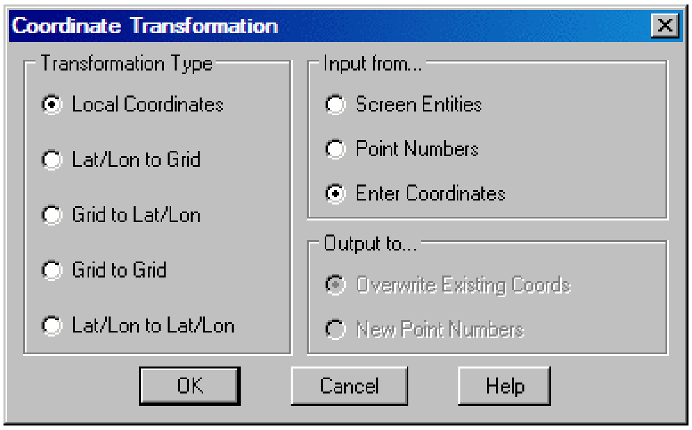
Job Description: KY421 Interchange
Job Number: 0417052112
Job Date: 04/17/2006

Compress CRD File: Removes unused point numbers by renumbering high point numbers into the unused spaces. For example, for an original file with points 1,2,105,107,108,109 would be compressed to 1,2,3,4,5,6.



Warning: this routine renumbers points to remove unused point numbers

Coordinate Transformation: Transforms coordinates between local, state plane 27, state plane 83, latitude/longitude, and Universal Transverse Mercator (UTM). Works on individually entered coordinates, by range of point numbers and with on-screen entities. For converting between state plane 27 and 83, Carlson calls upon NADCON from the National Geodetic Survey to apply the latitude/longitude adjustment. The NADCON program, ndcon210.exe, is stored in the Carlson EXEC directory.

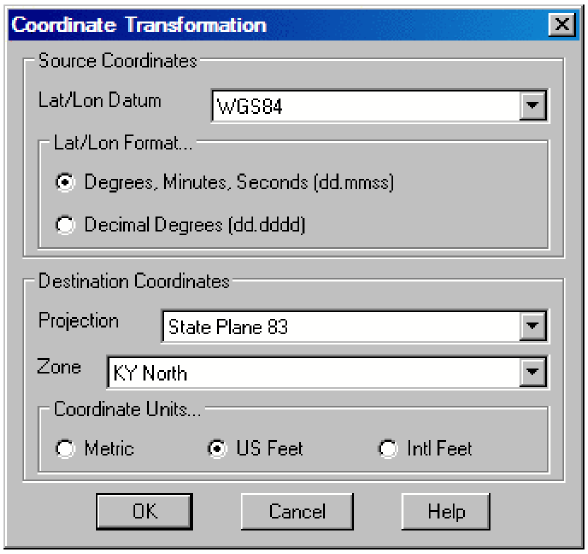

Coordinate Transformation

Transformation Type
● Local Coordinates
○ Lat/Lon to Grid
○ Grid to Lat/Lon
○ Grid to Grid
○ Lat/Lon to Lat/Lon

Input from...
○ Screen Entities
○ Point Numbers
● Enter Coordinates

Output to...
● Overwrite Existing Coords
○ New Point Numbers

The Transformation Type is used to define the Source Coordinate and Destination Coordinate formats. Settings for Lat/Long Datum, Lat/Long formats (dd.mmss or dd.dddd), Projections, State Plane Zones and coordinate units are defined in the Transformation Type dialog. The format of this dialog will change depending upon the type of transformation requested.

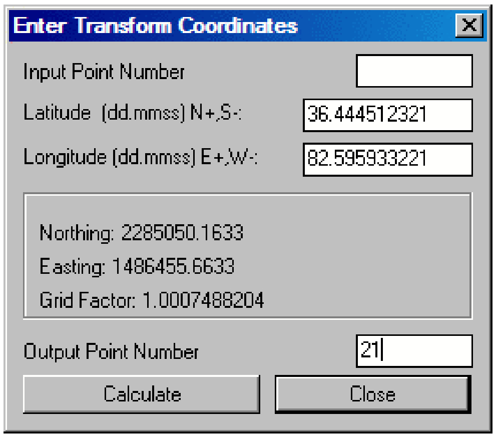

Coordinate Transformation

Source Coordinates
Lat/Lon Datum: WGS84
Lat/Lon Format...
● Degrees, Minutes, Seconds (dd.mmss)
○ Decimal Degrees (dd.dddd)

Destination Coordinates
Projection: State Plane 83
Zone: KY North
Coordinate Units...
○ Metric ● US Feet ○ Intl Feet

Example Lat/Long to Grid dialog

For all Transformation types, there are three options for inputting the data to be transformed. Data can be selected from the screen by using the **Screen Entities**. If a range of points or a particular point is desired, the **Point Numbers** option would be used. Manual entry of coordinates to transform one at a time is accomplished with the **Enter Coordinates** option. The coordinates can be typed in or use the Input Point Number option. Output Point Number is an option to store the results in the coordinate file.



Input Point Number

Latitude (dd.mmss) N+,S-: 36.444512321

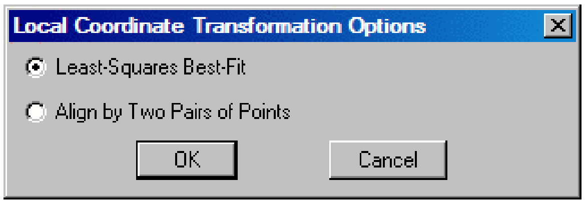
Longitude (dd.mmss) E+,W-: 82.595933221

Northing: 2285050.1633
Easting: 1486455.6633
Grid Factor: 1.0007488204

Output Point Number 21

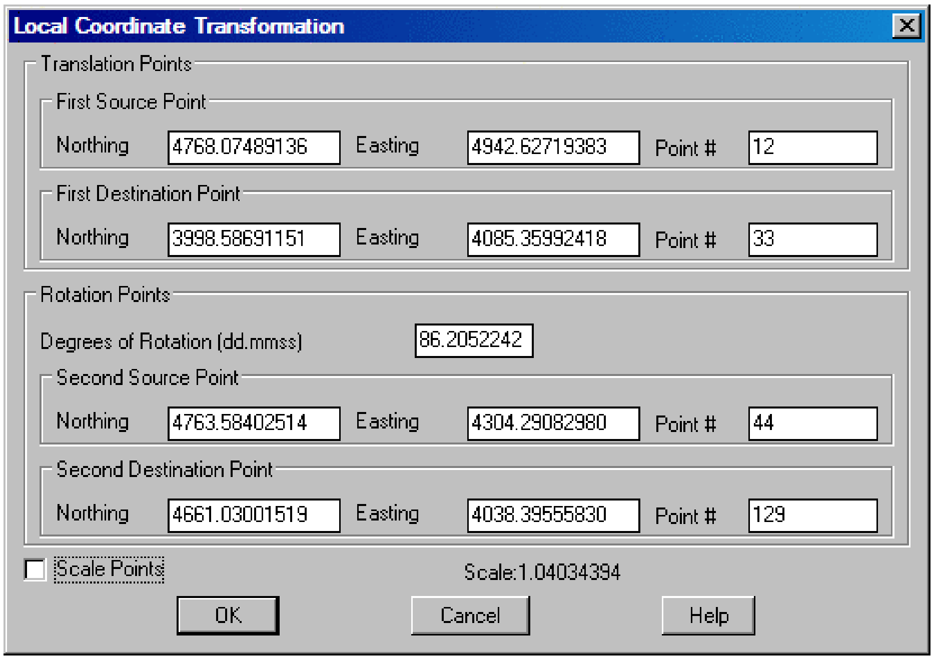
For all transformations there are two output options when using point numbers as the input data. **Overwrite Existing Coords** replaces the original coordinate values with the new coordinate values after transformation. **New Point Numbers** will retain the original coordinate data and point numbers and create new point numbers with the revised coordinate data after transformation.

When transforming a **Local Coordinate System**, there are two options for defining the transformation as shown in the next dialog.



● Least-Squares Best-Fit
○ Align by Two Pairs of Points

The **Align by Two Pairs of Points** option uses two pairs of source and destination coordinates. The first pair defines the translation as the difference between the source and destination northing and easting.



First Source Point: Northing 4768.07489136 Easting 4942.62719383 Point # 12

First Destination Point: Northing 3998.58691151 Easting 4085.35992418 Point # 33

Degrees of Rotation (dd.mmss) 86.2052242

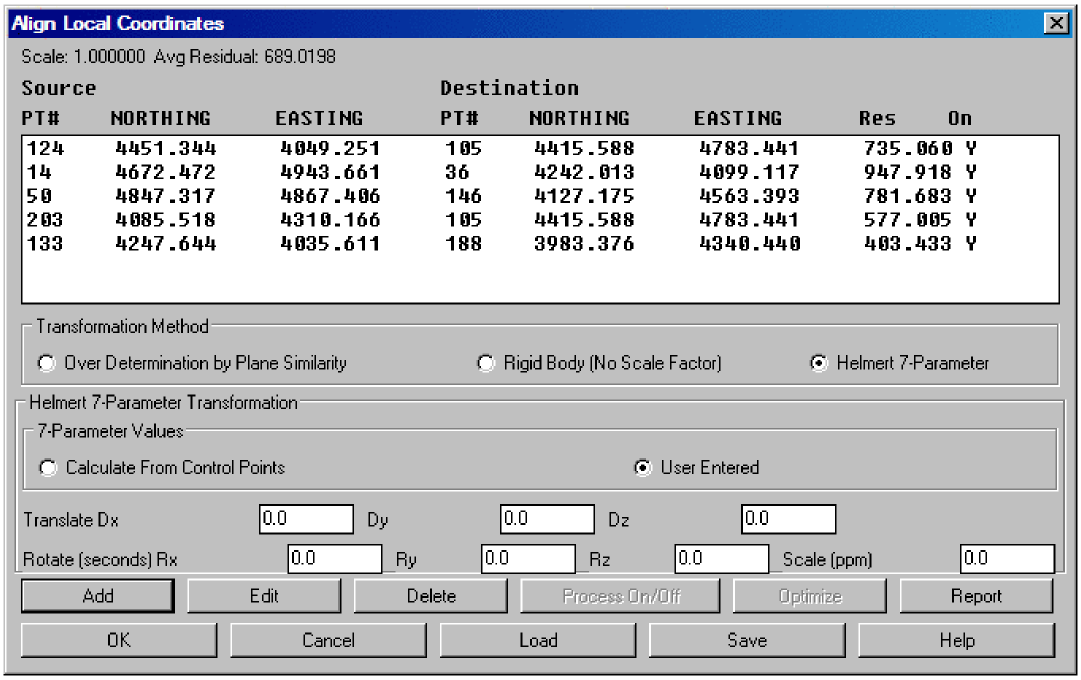
Second Source Point: Northing 4763.58402514 Easting 4304.29082980 Point # 44

Second Destination Point: Northing 4661.03001519 Easting 4038.39555830 Point # 129

☐ Scale Points Scale:1.04034394

This destination point is also the pivot point for rotation. Rotation can be entered directly or defined by a second pair of points where the bearing between the first and second source points is rotated to align with the bearing from the first and second destination points. There is an option to also apply scaling. The scaling holds the angle between points and adjusts the distances by the scale factor. The scale factor is calculated for each point as the elevation factor at the first source point times the grid factor at the first destination point averaged with the elevation factor at the transform point times the grid factor at the transform point.

The **Least-Squares Best-Fit** option is used when there are more than two pairs for translation points. Since two pairs of points are sufficient to define the translation and rotation, more than two pairs of points provides more than enough information.



Scale: 1.000000 Avg Residual: 689.0198

Source			Destination				
PT#	NORTHING	EASTING	PT#	NORTHING	EASTING	Res	On
124	4451.344	4049.251	105	4415.588	4783.441	735.060	Y
14	4672.472	4943.661	36	4242.013	4099.117	947.918	Y
50	4847.317	4867.406	146	4127.175	4563.393	781.683	Y
203	4085.518	4310.166	105	4415.588	4783.441	577.005	Y
133	4247.644	4035.611	188	3983.376	4340.440	403.433	Y

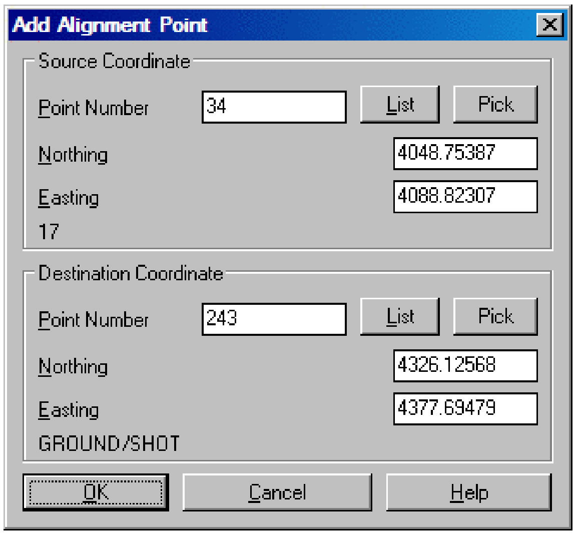
Transformation Method
○ Over Determination by Plane Similarity ○ Rigid Body (No Scale Factor) ● Helmert 7-Parameter

Helmert 7-Parameter Transformation
7-Parameter Values
○ Calculate From Control Points ● User Entered

Translate Dx 0.0 Dy 0.0 Dz 0.0
Rotate (seconds) Rx 0.0 Ry 0.0 Rz 0.0 Scale (ppm) 0.0

Over **Determination by Plane Similarity** is used to find the least squares best fit transformation for all the given source and destination points. Besides doing a translation and rotation, this option will also scales the points during the transformation. **The Rigid Body Transformation** also does a best fit least squares transformation, but applies only translation and rotation with no scale. The **Helmert 7-Parameter** method can also be used for local transformations. The **7-Parameter Values** can be calculated from control points or entered by the user.

The **Add** button is used to define the source and destination coordinates for the points that define the transformation. Pressing this button brings up the following dialog box.



Source Coordinate
Point Number 34
Northing 4048.75387
Easting 4088.82307
17

Destination Coordinate
Point Number 243
Northing 4326.12568
Easting 4377.69479
GROUND/SHOT

The **Edit** button is used to edit existing data.

The **Delete** button removes the source and destination pairing from the transformation setup.

The **Process On/Off** button allows source and destination pairings to be turned on and off. This is useful when wanting to inspect different results using different pairings.

The **Optimize** option chooses which point pairings would yield the best transformation results by turning off the processing of pairings with higher residuals. This minimizes the average residual for the control points.

The **Report** option displays a report of the transformation point pairings, their residuals, processing status, transformation scale and avg. residual.

The **Load** and **Save** options allow for saving and recalling local coordinate transformation pairings and settings.

Draw Entities by Point ID: Draw Lines, Arcs, 3DLines, Polylines or 3DPolys by defining a range of point numbers.

Prompts

Plot Entities by Point Number

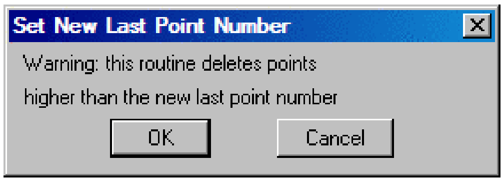
Type of entity, Arc/Polyline/3dpoly/2dline/Exit/<Line>: *P* This response causes the program to plot polylines.

Example: '1∗4-7-10∗12-5-8' would draw lines from point number's 1 through 4 then to 7, to 10 through 12, then to 5 to 8. (limit 132 characters)

Undo/<Enter point numbers or ranges>: *1∗10-20∗30*

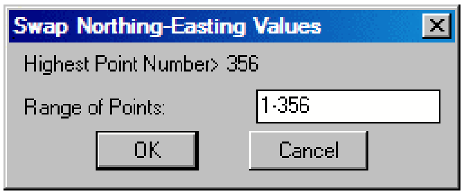
The program draws a polyline from point number 1 through 10 to point number 20 through 30.

New Last Point Number: This option sets the highest point number in the CRD file. All points above this number are erased.


Set New Last Point Number

Warning: this routine deletes points higher than the new last point number

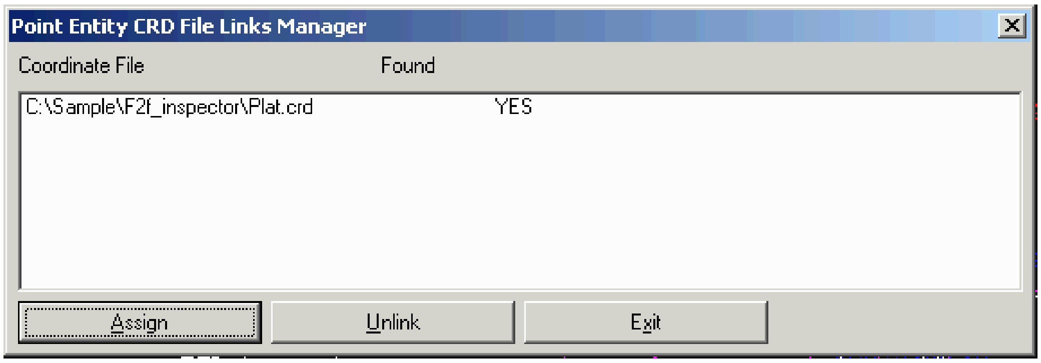
Swap Northing-Easting: This option allows you to swap northing and easting coordinates for any selected range of points. What was the northing of an existing coordinate point, or range of points, becomes the easting. And the easting(s) becomes the northing(s).


Swap Northing-Easting Values

Highest Point Number> 356

Range of Points: 1-356

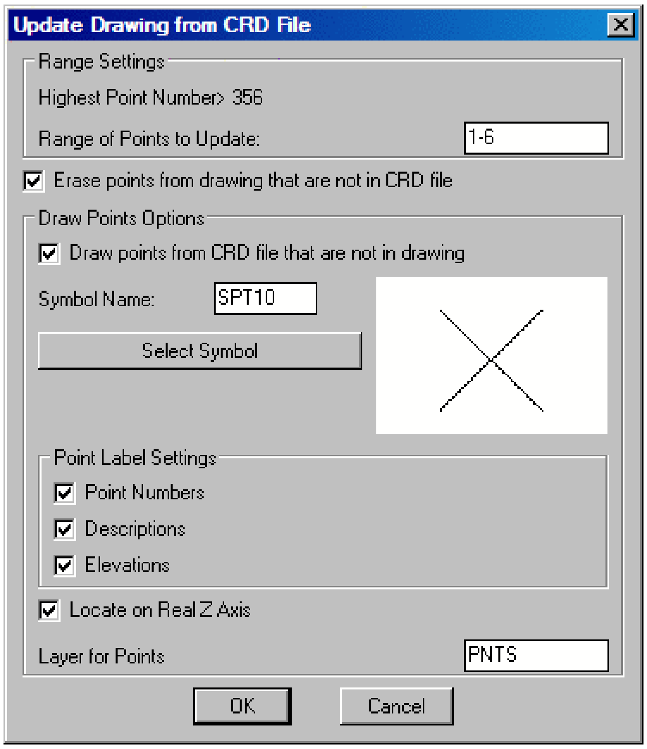
Point Entry CRD File Links Manager: When points are created in the drawing, the program records the source coordinate file for the points. The coordinate file names assigned to the point entities links the point entities back to the coordinate file. These links are used by routines that process the point entities and then need to reference the coordinate file such as Move Point which selects a point entity and updates the coordinate file. This routine checks all the point entities in the drawing and lists all the linked coordinate files. You can use the Assign button to set the coordinate file assigned to point entities which is useful when the coordinate file has been moved after the points were drawn. Use the Unlink button to remove the link.



Point Entity CRD File Links Manager

Coordinate File	Found
C:\Sample\F2f_inspector\Plat.crd	YES

Update Drawing from CRD File: This function updates the position of Carlson points in the drawing to match the position stored in the coordinate file. This command also has options to erase and draw points. For the erase option, points are erased from the drawing if the point number does not exist in the coordinate file. For the draw option, if a point number in the CRD file does not exist in the drawing, then this point is drawn using the settings from the dialog. The number of points modified, erased and drawn is reported at the end of the command.



Update Drawing from CRD File

Range Settings

Highest Point Number> 356

Range of Points to Update: 1-6

☑ Erase points from drawing that are not in CRD file

Draw Points Options

☑ Draw points from CRD file that are not in drawing

Symbol Name: SPT10

Point Label Settings

☑ Point Numbers

☑ Descriptions

☑ Elevations

☑ Locate on Real Z Axis

Layer for Points: PNTS

Update CRD File from Drawing: This function allows you to select all or some of the points in the drawing and add or update them to the .CRD file. The points can be filtered with AutoCAD's Select Objects: selection mechanism and/or wild card matching of the point descriptions. The Update Point Descriptions option determines whether the point descriptions from the drawing will be stored to the CRD file. Use this command to update the file after a global edit such as *Move, Rotate, Renumber Points, Change Elevations, Erase,* etc. This routine directly reads Leica (Wildsoft), Softdesk, Geodimeter, InRoads, Land Development Desktop, and Eagle Point point blocks.

List Points: List the points stored in the .CRD file. See the *List Points* command in this chapter for more information.

Delete Points: Deletes points in the coordinate (crd) file by point number or description.

Screen Pick Point: Pick a point on the graphics screen and it's coordinate values are added to the coordinate (crd) file. Prompts for point number, elevation and description will be displayed. This command does not plot a point, point attributes or point symbol. Use the command *Draw-Locate Points* command to do this.

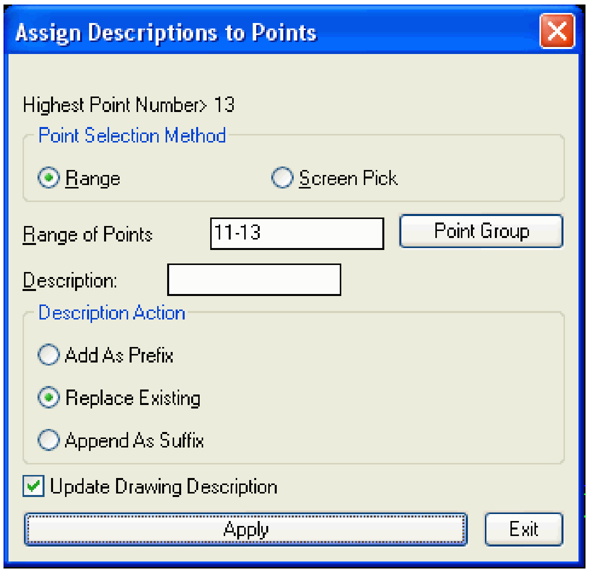
Scale Points: This option multiplies the point northing, easting, and elevation by the scale conversion factor. You can use this routine for metric-English conversion. See the *Scale Points* command in this chapter for more information.

Translate Points: This option translates a range of points based on entered delta x and delta y, entered coordinates or translation point numbers. See the *Translate Points* command in this chapter for more information.

Rotate Points: This option rotates a range of points based on entered degrees or rotation, entered azimuths, entered bearings or rotation point numbers. See the *Rotate Points* command in this chapter for more information.

Align Points: This option does a translate based on a source point and destination point and then rotates to align the first source point and a second source point with the first destination point and a second destination point. See the *Align Points* command in this chapter for more information.

Description for Points: This routine modifies the point description field with the user-specified text for a range of point numbers. There is an option to update the description attributes of the points in the drawing in addition to updating the coordinate file.



Highest Point Number> 13

● Range ○ Screen Pick

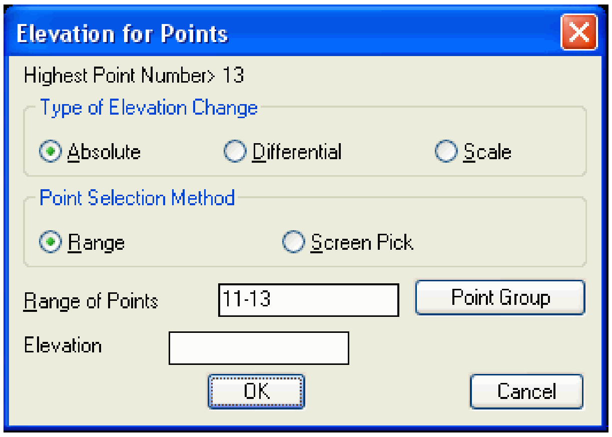
Range of Points 11-13

Description:

○ Add As Prefix
● Replace Existing
○ Append As Suffix

☑ Update Drawing Description

Elevation for Points: This routine modifies the elevation of the specified points. The Absolute method sets the elevations to the specified value. The Differential method adds the value to the current elevations. The Scale method multiplies the current elevations by the value.



Highest Point Number> 13

● Absolute ○ Differential ○ Scale

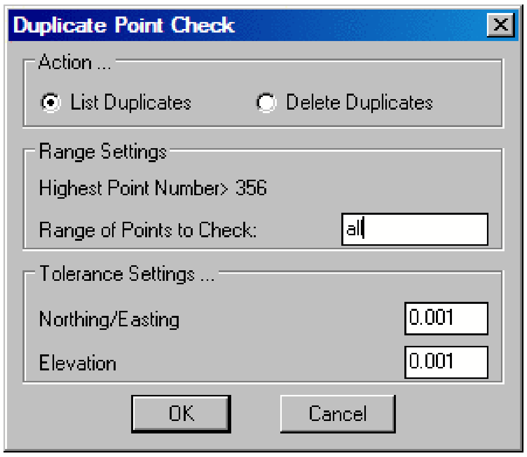
● Range ○ Screen Pick

Range of Points 11-13

Elevation

Point Number Report: This routine lists the used and the unused point numbers in the CRD file.

Duplicate Points: This function searches the CRD file for points with the same northing, easting and elevation. The tolerances for considering points to have the same coordinate are set in the dialog separately for northing/easting and elevation. To be counted the same coordinate, both the northing/easting and elevation must be within the tolerance distance. The duplicate points can be erased or only reported. For the erase option, the first point number is kept and any higher point numbers with duplicate coordinates are erased from the CRD file.


Duplicate Point Check
Action ...
Range Settings
Tolerance Settings ...
OK
Cancel

● List Duplicates ○ Delete Duplicates

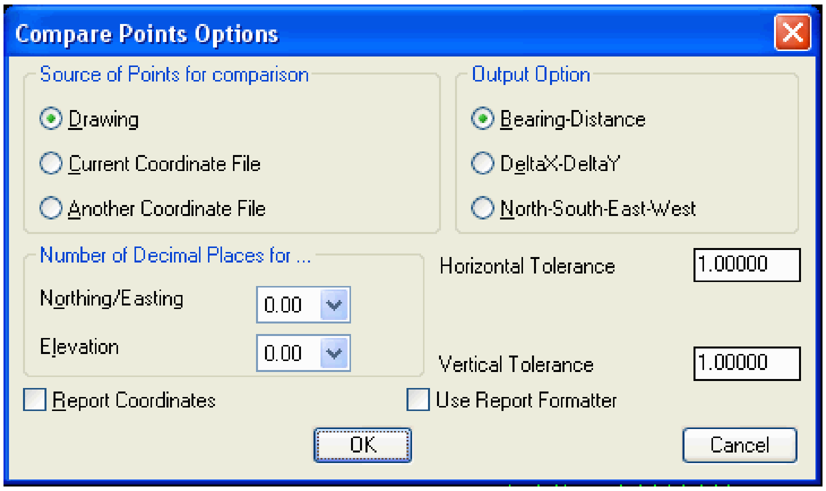
Highest Point Number> 356

Range of Points to Check: all

Northing/Easting 0.001

Elevation 0.001

Compare Points: This function compares the coordinates in the .CRD file with either the coordinates for the matching point numbers in the drawing file, with matching point numbers from another CRD file or with different point numbers from the same CRD file. A report is created for any differences that shows the point numbers and the differences. The difference can be reported as a bearing and distance between the two points, as distance North/South and East/West or as the delta-X and delta-Y. There is an option whether to include the point coordinates in the report.


Compare Points Options
Source of Points for comparison
Output Option
Number of Decimal Places for ...
OK
Cancel

● Drawing
○ Current Coordinate File
○ Another Coordinate File

● Bearing-Distance
○ DeltaX-DeltaY
○ North-South-East-West

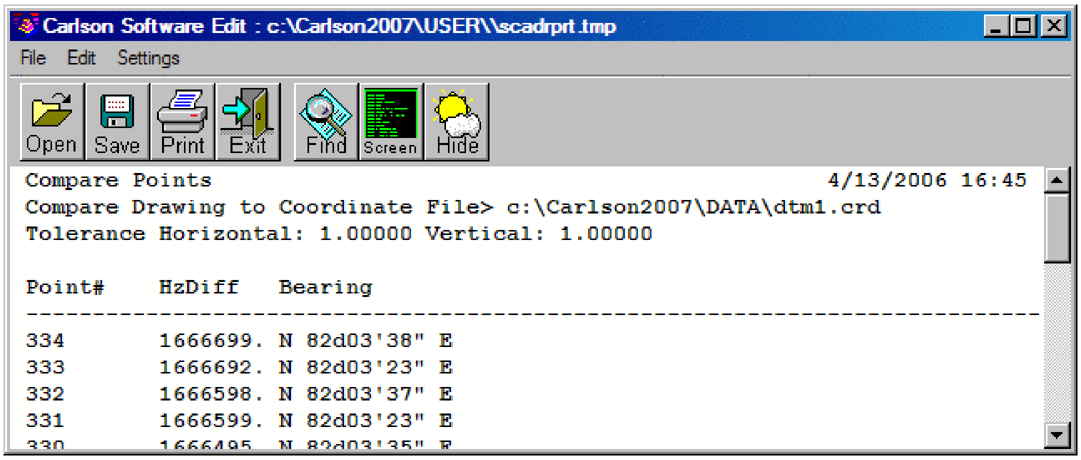
Northing/Easting 0.00

Elevation 0.00

Horizontal Tolerance 1.00000

Vertical Tolerance 1.00000

☐ Report Coordinates ☐ Use Report Formatter

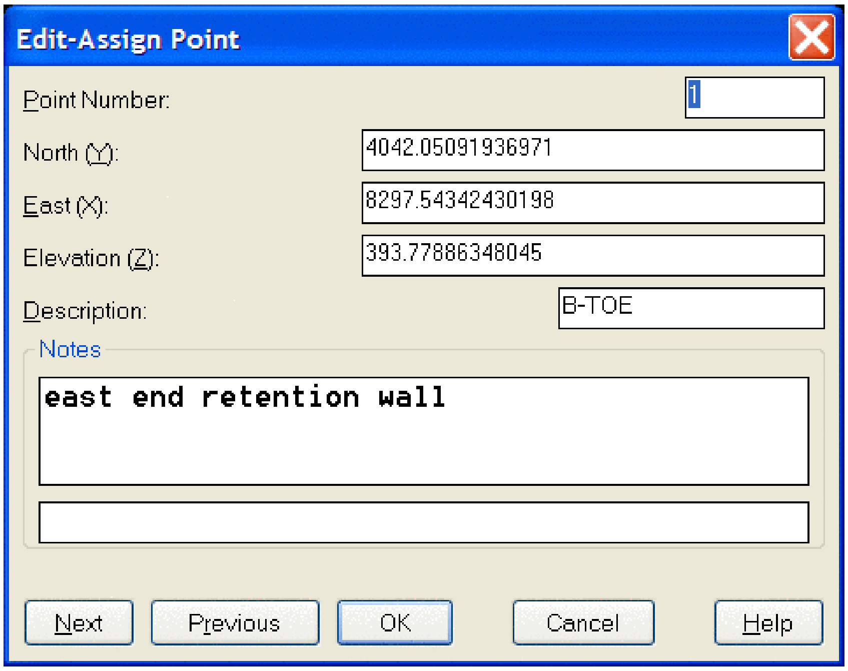

Carlson Software Edit : c:\Carlson2007\USER\\scadrpt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Compare Points                                             4/13/2006 16:45
Compare Drawing to Coordinate File> c:\Carlson2007\DATA\dtm1.crd
Tolerance Horizontal: 1.00000 Vertical: 1.00000

Point#     HzDiff    Bearing
----------------------------------------------------------------------------
334        1666699. N 82d03'38" E
333        1666692. N 82d03'23" E
332        1666598. N 82d03'37" E
331        1666599. N 82d03'23" E
```

Example Bearing-Distance format Compare Points Report

Renumber Points: This option renumbers points in the user-specified range starting from a new point number. The old point numbers are erased. The condense points will renumber such that there are no unused point numbers in the renumbered range. Otherwise the spaces between the points is maintained. In the example shown, renumbering 1-25 with points 1,2,24,25 to starting point number 101 will result in points 101,102,103,104 if condense is on or 101,102,124,125 if condense is off.

Input-Edit Point: Enter or edit the coordinate values or the description of a point. The Notes section is for adding optional point notes which are additional point descriptions. The standard description field is limited to 32 characters. Under notes, any number of lines of text can be assigned to the point. A list box shows the lines of notes. To add a note line, pick a blank line in the list box and then type in the note in the edit box belong the list box and press Enter. To edit a note, highlight the line in the list box and edit the text in the edit box.


Edit-Assign Point

Point Number: 1

North (Y): 4042.05091936971

East (X): 8297.54342430198

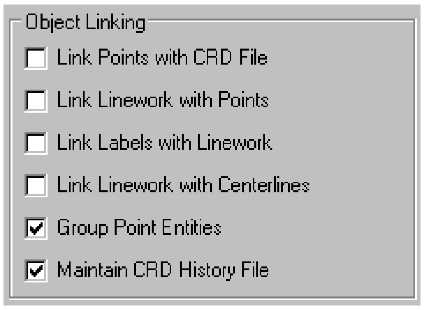
Elevation (Z): 393.77886348045

Description: B-TOE

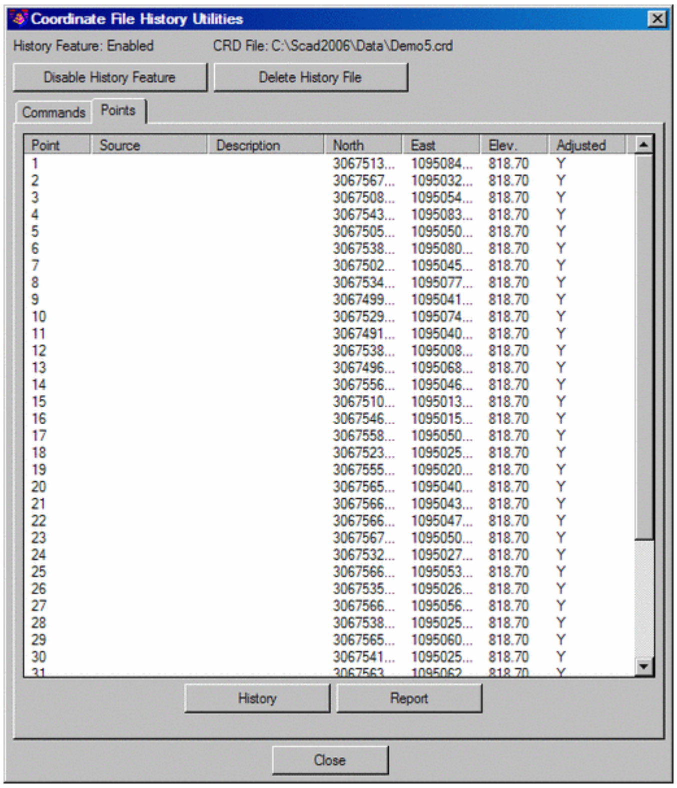
Notes

east end retention wall

Point History: All changes to the coordinate file will record the commands performed on this coordinate file and the status of the points themselves. This makes up the coordinate file history. The history can then be reported by point number or by command. All of the changes can be rolled back. It is important to note that if maintaining such a history file is your objective, in the Settings > Configure > General Settings dialog you must make sure that Maintain CRD History File is checked.


Object Linking

☐ Link Points with CRD File
☐ Link Linework with Points
☐ Link Labels with Linework
☐ Link Linework with Centerlines
☑ Group Point Entities
☑ Maintain CRD History File



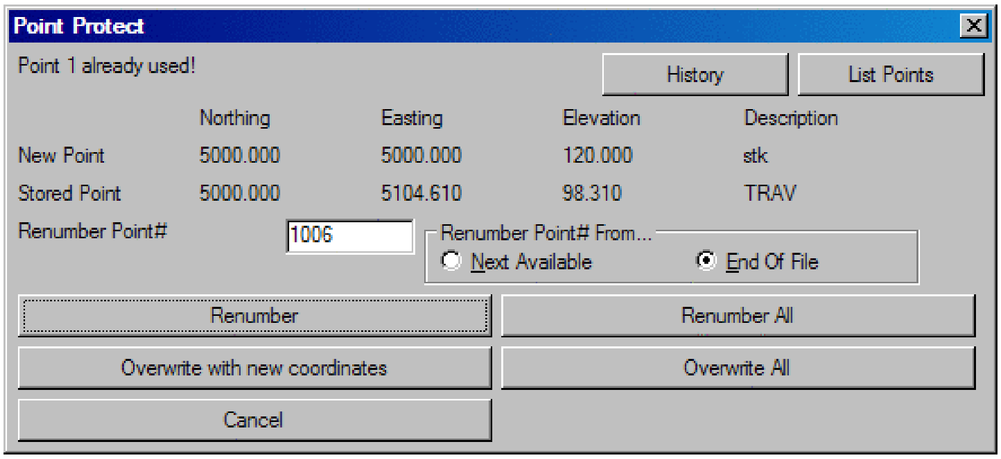
History Feature: Enabled

CRD File: C:\Scad2006\Data\Demo5.crd

Point	Source	Description	North	East	Elev.	Adjusted
1			3067513...	1095084...	818.70	Y
2			3067567...	1095032...	818.70	Y
3			3067508...	1095054...	818.70	Y
4			3067543...	1095083...	818.70	Y
5			3067505...	1095050...	818.70	Y
6			3067538...	1095080...	818.70	Y
7			3067502...	1095045...	818.70	Y
8			3067534...	1095077...	818.70	Y
9			3067499...	1095041...	818.70	Y
10			3067529...	1095074...	818.70	Y
11			3067491...	1095040...	818.70	Y
12			3067538...	1095008...	818.70	Y
13			3067496...	1095068...	818.70	Y
14			3067556...	1095046...	818.70	Y
15			3067510...	1095013...	818.70	Y
16			3067546...	1095015...	818.70	Y
17			3067558...	1095050...	818.70	Y
18			3067523...	1095025...	818.70	Y
19			3067555...	1095020...	818.70	Y
20			3067565...	1095040...	818.70	Y
21			3067566...	1095043...	818.70	Y
22			3067566...	1095047...	818.70	Y
23			3067567...	1095050...	818.70	Y
24			3067532...	1095027...	818.70	Y
25			3067566...	1095053...	818.70	Y
26			3067535...	1095026...	818.70	Y
27			3067566...	1095056...	818.70	Y
28			3067538...	1095025...	818.70	Y
29			3067565...	1095060...	818.70	Y
30			3067541...	1095025...	818.70	Y
31			3067563	1095062	818.70	Y

The **Disable History Feature** button at the top of the dialog shown above is a toggle device. It should be clicked if you prefer not to build the point history file. Clicking it a second time changes it back to saying **Enable History Feature**. You can also choose **Delete History File** to delete the file altogether. By clicking any point from the list, as shown in the Points tab example above, and then selecting **History**, you will be given the history for that specific point. Double-clicking on any command shows the details. Clicking on **Details** also shows the selected command's details. **Undo thru Selected** will undo the effect of all of the commands up through and including the selected command. The changes from the undo command are themselves then added to the command list and can be undone in the future.

Point Protect Toggle: This option, located at the bottom-left of the main *Coordinate File Utilities* dialog, toggles point protection on and off. With this option on, when attempting to store a point with a point identifier (point number) that already exists in the current coordinate file, the following dialog will be displayed.



Point 1 already used!

	Northing	Easting	Elevation	Description
New Point	5000.000	5000.000	120.000	stk
Stored Point	5000.000	5104.610	98.310	TRAV

Renumber Point# 1006

Renumber Point# From...
○ Next Available ● End Of File

Overwrite with new coordinates will update the existing point number with the new location of the point.

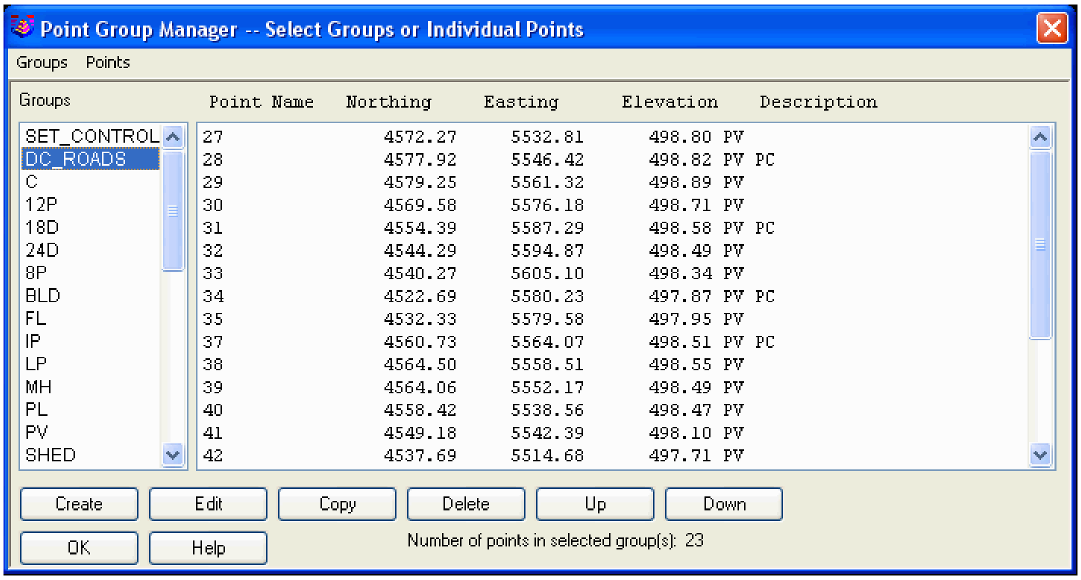
The **Use Another Number** field displays the point number that will be used if the Use Another Number option is selected. This number will depend upon the option chosen from the **Another Number From** settings. If **Next Available** is chosen, the next available number will be displayed in the Use Another Number Field. If there are number gaps in the coordinate file this number will not be the next highest number in the file. For example if points 1-10 and 20-30 exist in the crd file leaving a gap from 11-19, the Next Available number would be 11. If the desired point number, in this example, is 31, then the option of **End of File** would be selected.

The **Overwrite All** and **Renumber All** options apply when more than one point with the same number exists in the coordinate file. These options are helpful when importing points into existing CRD files.

Pulldown Menu Location: Points
Keyboard Command: cfu
Prerequisite: None

Point Group Manager

This command is used to create point groups based on inclusion and exclusion filters. The manager can perform various functions on these point groups. Also point groups can be referenced by group name in other commands such as Field to Finish and Data Collection.

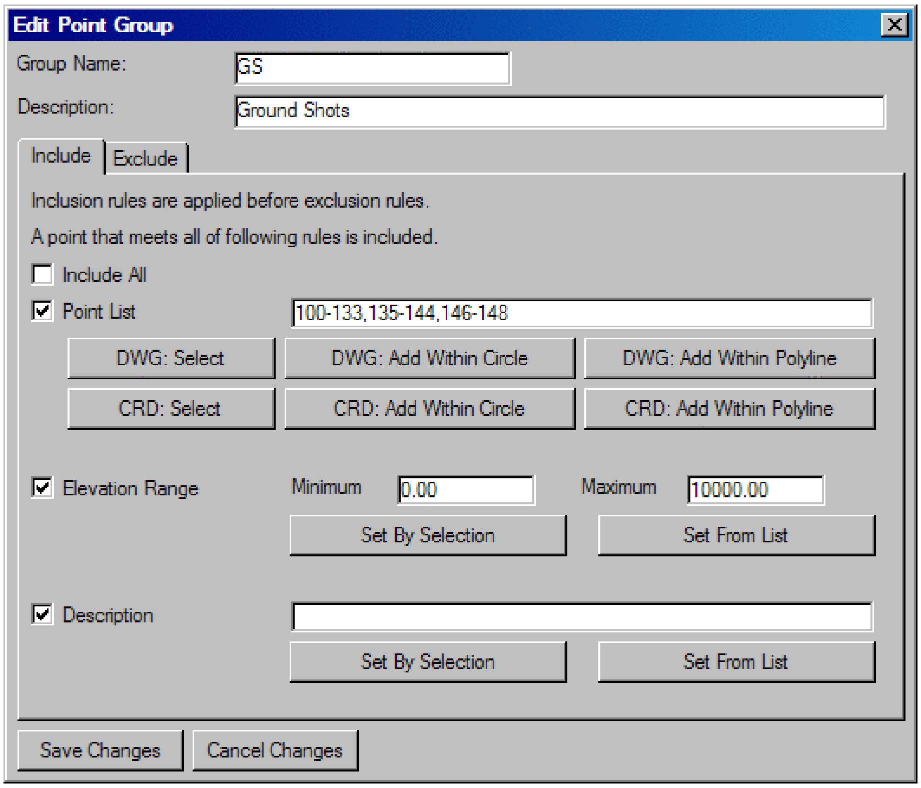


Point Name	Northing	Easting	Elevation	Description
27	4572.27	5532.81	498.80	PV
28	4577.92	5546.42	498.82	PV PC
29	4579.25	5561.32	498.89	PV
30	4569.58	5576.18	498.71	PV
31	4554.39	5587.29	498.58	PV PC
32	4544.29	5594.87	498.49	PV
33	4540.27	5605.10	498.34	PV
34	4522.69	5580.23	497.87	PV PC
35	4532.33	5579.58	497.95	PV
37	4560.73	5564.07	498.51	PV PC
38	4564.50	5558.51	498.55	PV
39	4564.06	5552.17	498.49	PV
40	4558.42	5538.56	498.47	PV
41	4549.18	5542.39	498.10	PV
42	4537.69	5514.68	497.71	PV

Number of points in selected group(s): 23

Groups Pulldown

Create Point Group:
This routine creates point groups. When selected, the New Point Group dialog box is displayed.


Edit Point Group
Include
Exclude
DWG: Select
DWG: Add Within Circle
DWG: Add Within Polyline
CRD: Select
CRD: Add Within Circle
CRD: Add Within Polyline
Set By Selection
Set From List
Set By Selection
Set From List
Save Changes
Cancel Changes

Group Name: GS

Description: Ground Shots

Inclusion rules are applied before exclusion rules.

A point that meets all of following rules is included.

☐ Include All

☑ Point List 100-133,135-144,146-148

☑ Elevation Range Minimum 0.00 Maximum 10000.00

☑ Description

Group Name is the name of Point Group to create.

Description is the description of Point Group to create.

Use the **Include Tab** to define the filters to be applied when creating the point group. Inclusion rules are applied before the exclusion rules.

When **Include All** is toggled on, all points in the coordinate file will be included in the selection.

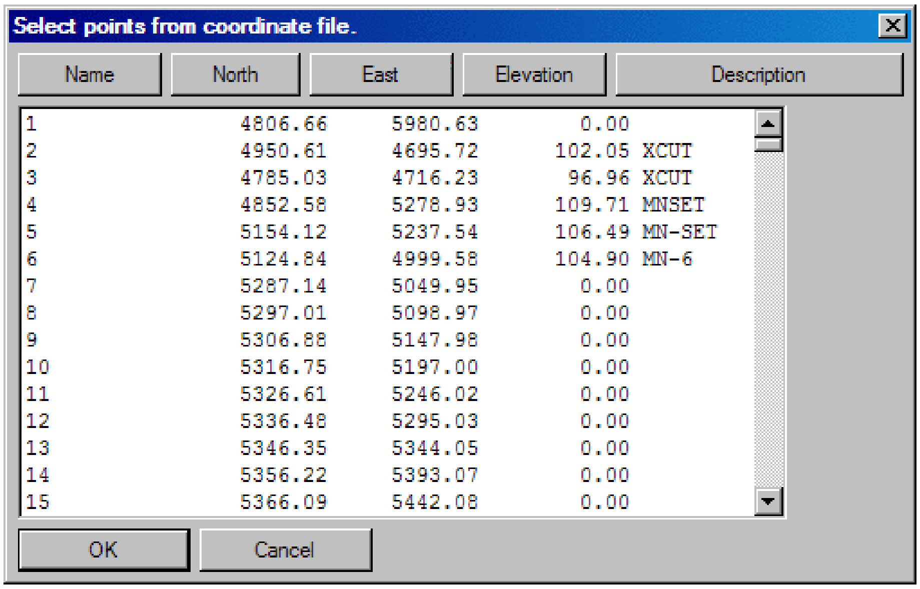
When **Point List** is toggled on, an option of defining the point list must be selected.

DWG: Select allows for manual selection of the points to include from the drawing. The points must be drawn on the screen prior to using this option. All standard AutoCAD selection tools, are available for selection of the points.

DWG: Add Within Circle allows for selection of the points to include by a user defined circle. The circle is defined by specifying the center and radius of the circle. The radius can be defined by entering in a numeric value or by picking on the screen. Points must be drawn to the screen prior to using this option.

DWG: Add Within Polyline allows for the selection of points to include by referencing a closed polyline. All points located within the closed polyline will be included in the selection. Prompts for the inclusion polyline and the exclusion polyline will display. The inclusion polyline limits of the selection area. The exclusion polyline defines the area to exclude within the inclusion polyline. Points must be drawn to the screen prior to using this option.

CRD: Select allows for manual selection of the points to include from a point list. Standard window selection tools are available for selecting the points to include.



Name	North	East	Elevation	Description
1	4806.66	5980.63	0.00	
2	4950.61	4695.72	102.05	XCUT
3	4785.03	4716.23	96.96	XCUT
4	4852.58	5278.93	109.71	MNSET
5	5154.12	5237.54	106.49	MN-SET
6	5124.84	4999.58	104.90	MN-6
7	5287.14	5049.95	0.00	
8	5297.01	5098.97	0.00	
9	5306.88	5147.98	0.00	
10	5316.75	5197.00	0.00	
11	5326.61	5246.02	0.00	
12	5336.48	5295.03	0.00	
13	5346.35	5344.05	0.00	
14	5356.22	5393.07	0.00	
15	5366.09	5442.08	0.00	

CRD: Add Within Circle allows for selection of the points to include by a user defined circle. The circle is defined by specifying the center and radius of the circle. The radius can be defined by entering in a numeric value or by picking on the screen. The points do NOT have to be drawn to the screen prior to selection.

CRD: Add Within Polyline allows for the selection of points to include by referencing a closed polyline. All points located within the closed polyline will be included in the selection. Prompts for the inclusion polyline and the exclusion polyline will display. The inclusion polyline limits of the selection area. The exclusion polyline defines the area to exclude within the inclusion polyline. The points do NOT have to be drawn to the screen prior to selection.

Elevation Range allows for the selection of points within a specified elevation range to be included in the group. The minimum and maximum elevations can be entered manually in their respective data fields. The minimum and maximum values can also be specified by the Set By Selection and Set From List options.

Set By Selection allows for selection of points to include in the group from the drawing. The points must be drawn to the screen prior to using this selection method. Standard AutoCAD selection methods are available.

Set From List allows for selection of points to include in the group from a point list. Standard Windows selection tools are available with this option.

The **Description** option allows for a selection of points to include based upon the description of the point. The description to filter for can be entered in the data field or by using the Set By Selection and/or the Set From List options described above.

The **Exclude Tab** allows for defining rules that pertain to the points to be excluded from the Inclusion selection. After defining the inclusion rules for the group, the options on the Exclude tab can be used to filter for points to exclude from the group. For example, if the inclusion rules call for all points within the elevation range of 8 to 12, an exclusion rule can be set to exclude the points on elevation 9 or with the description tree. The options on this tab work exactly like the options on the Include tab. Please refer to the Include tab definitions for further instruction.

Save Changes saves the point group to the group name specified based upon the Inclusion and Exclusion rules specified.

Cancel Changes discards specified rules and changes and goes back to the Point Group Manager dialog.

Edit Point Group:
This function allows for editing of existing point groups. From the list of available groups, highlight the group or groups to edit. When complete with the first group, if more than one is selected, selecting the Save Changes option will save the changes to the active group and switch to the next group in the selection set.

From the Groups pulldown, select Edit Groups, the Edit Group dialog box will now appear.

See Create Point Groups for further definitions of the available options.

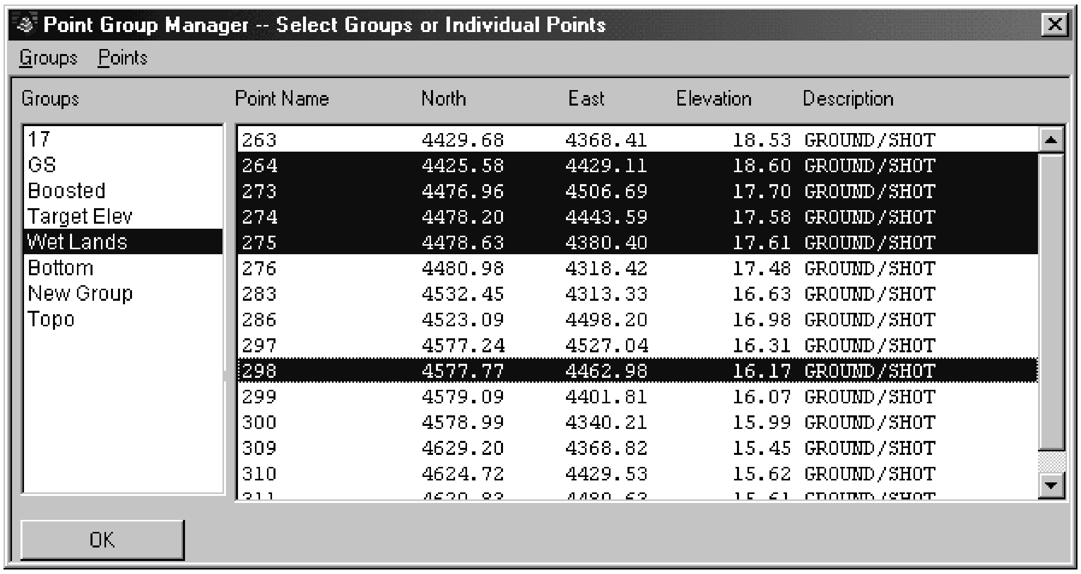
Delete Point Group:
This deletes specified groups for the existing group list. One or more groups can be deleted at one time.

Copy Point Group:
This routine creates a new point group by copying the currently highlighted group. This allows you to modify an existing group definition and create a new group.

Import Point Groups:
This allows for importing filters from point group manager settings of other coordinate files. This is a useful option when coordinate files are going to contain same point group names with the same filters. This option only brings in the filters into the point group manager, it does not import actual points into the coordinate file by group name. Existing points in the active coordinate file that meet the filter definitions of the imported point groups will automatically be added to the corresponding group.

Points Pulldown

Insert into Drawing:
This routine draws the points in the group in the drawing. Individual points or point ranges can be selected from the group to be erased from the drawing. For example points 264-275 and point 298 contained in group Wet Lands are tagged to be erased from the drawing in the following figure.



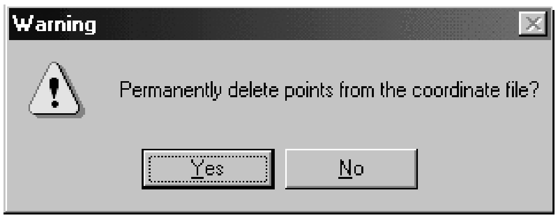
Groups
- 17
- GS
- Boosted
- Target Elev
- Wet Lands
- Bottom
- New Group
- Topo

Point Name	North	East	Elevation	Description
263	4429.68	4368.41	18.53	GROUND/SHOT
264	4425.58	4429.11	18.60	GROUND/SHOT
273	4476.96	4506.69	17.70	GROUND/SHOT
274	4478.20	4443.59	17.58	GROUND/SHOT
275	4478.63	4380.40	17.61	GROUND/SHOT
276	4480.98	4318.42	17.48	GROUND/SHOT
283	4532.45	4313.33	16.63	GROUND/SHOT
286	4523.09	4498.20	16.98	GROUND/SHOT
297	4577.24	4527.04	16.31	GROUND/SHOT
298	4577.77	4462.98	16.17	GROUND/SHOT
299	4579.09	4401.81	16.07	GROUND/SHOT
300	4578.99	4340.21	15.99	GROUND/SHOT
309	4629.20	4368.82	15.45	GROUND/SHOT
310	4624.72	4429.53	15.62	GROUND/SHOT

The symbol to be used and the attribute layout are determined by the Point Default Settings. The symbol size and the point attribute size are determined by the settings in the Drawing Setup routine.

Erase from Drawing:
This erases specified point group/groups or specified points from within the group from the drawing.

Erase from Coordinate File and Drawing:
This erases the points in the specified group/groups or specified points from within the group from the drawing and will also permanently delete the points from the CRD file. You will be prompted with a warning as follows:


Warning

Permanently delete points from the coordinate file?

Selecting **Yes** will complete the command and erase the points from the screen and also the coordinate file. Selecting **No** will cancel the command leaving the drawing and the coordinate file unchanged.

Report:
The routine will generate a point list of the points contained in the selected group/groups or specified points from within the group.

Highlight:
This routine highlights the specified objects in the drawing. This makes them distinguishable from the other points on the screen.

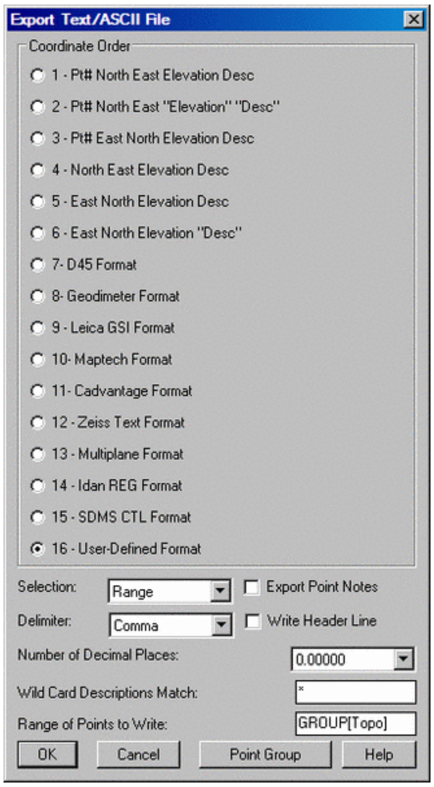
Freeze:
This routine freezes the points like the Points->Freeze Points command.

Thaw All:
This routine thaw the points like the Points->Thaw Points command.

Draw 2D Line:
This routine draws a 2d polyline between the points contained in the group/groups or between specified points in a group.

Export:
This command exports the selected group/groups or the specified point(s) or range of points from within the group to various formats. The available formats are ASCII/Text, Carlson Software CRD and C&G CRD files.

When **ASCII/Text** is selected, the Export Text/ASCII File dialog box will be displayed. Please refer to the Export Text/ASCII File section of the manual for more information.


Export Text/ASCII File

Coordinate Order

○ 1 - Pt# North East Elevation Desc
○ 2 - Pt# North East "Elevation" "Desc"
○ 3 - Pt# East North Elevation Desc
○ 4 - North East Elevation Desc
○ 5 - East North Elevation Desc
○ 6 - East North Elevation "Desc"
○ 7- D45 Format
○ 8- Geodimeter Format
○ 9 - Leica GSI Format
○ 10- Maptech Format
○ 11- Cadvantage Format
○ 12 - Zeiss Text Format
○ 13 - Multiplane Format
○ 14 - Idan REG Format
○ 15 - SDMS CTL Format
● 16 - User-Defined Format

Selection: Range
☐ Export Point Notes
Delimiter: Comma
☐ Write Header Line
Number of Decimal Places: 0.00000
Wild Card Descriptions Match: *
Range of Points to Write: GROUP[Topo]

The **CRD-Carlson software** command writes the selected group/groups or the specified point(s) or range of points within the group to a new Carlson formatted CRD file.

Specify the file name of the CRD file to create and press save.

CRD-C&G writes the selected group/groups or the specified point(s) or range of points within the group to a new C&G formatted CRD file.

Specify the file name of the CRD file to create and press save.

Button Functions

The series of buttons at the bottom of the main dialog do the same functions as the routines in the Groups pull-down menu except the Move Up and Move Down which are only available as these buttons. The Move Up/Down simply change the display order of the groups in the list.

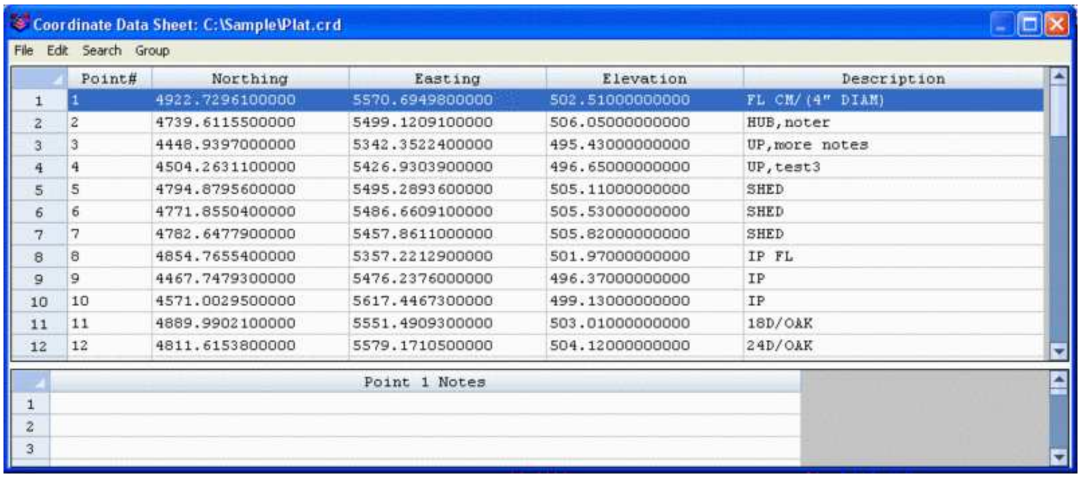
Pulldown Menu Location: Points
Keyboard Command: pgm
Prerequisite: A coordinate file

Edit Points

This command edits point data in the current coordinate file or within a point range. The current coordinate file can be set with the Set Coordinate File command. Edit Points shows all the points in the coordinate file. New points can be added and points can be deleted by using the Insert and Delete keys.

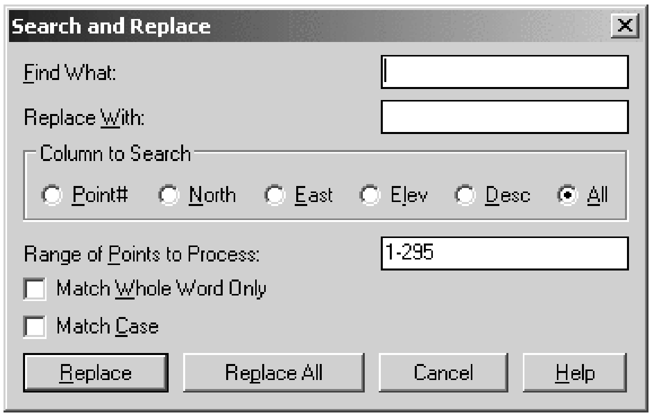
The Group option allows you to edit subset collection of points as defined by Point Group Manager. This Group method is a way to filter the points by point range, elevation range or description.

This tool also lets you edit notes associated with each point. While the standard point description is limited to 32 characters, the drawing notes are not. When you click on a given point, you can add numerous lines of notes about that point in the bottom of the dialog. Keep in mind that these notes are stored in a separate file with the extension ".not" having the same name as the CRD and residing in the same folder.



	Point#	Northing	Easting	Elevation	Description
1	1	4922.7296100000	5570.6949800000	502.51000000000	FL CM/(4" DIAM)
2	2	4739.6115500000	5499.1209100000	506.05000000000	HUB,noter
3	3	4448.9397000000	5342.3522400000	495.43000000000	UP,more notes
4	4	4504.2631100000	5426.9303900000	496.65000000000	UP,test3
5	5	4794.8795600000	5495.2893600000	505.11000000000	SHED
6	6	4771.8550400000	5486.6609100000	505.53000000000	SHED
7	7	4782.6477900000	5457.8611000000	505.82000000000	SHED
8	8	4854.7655400000	5357.2212900000	501.97000000000	IP FL
9	9	4467.7479300000	5476.2376000000	496.37000000000	IP
10	10	4571.0029500000	5617.4467300000	499.13000000000	IP
11	11	4889.9902100000	5551.4909300000	503.01000000000	18D/OAK
12	12	4811.6153800000	5579.1710500000	504.12000000000	24D/OAK

	Point 1 Notes
1	
2	
3	



Range of Points to Process: 1-295

☐ Match Whole Word Only

☐ Match Case

Pulldown Menu Location: Points
Keyboard Command: editpt
Prerequisite: None

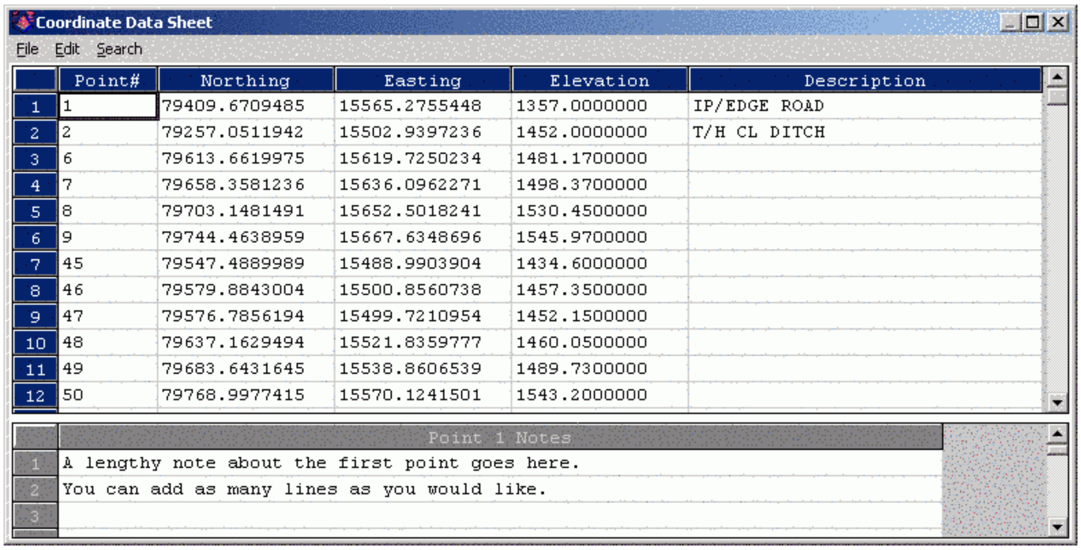
Spreadsheet Edit Points

This command edits point data in the current coordinate file. The current coordinate file can be set with the Set Coordinate File command. Edit Points shows all the points in the coordinate file. New points can be added and points can be deleted by using the Insert and Delete keys.

This tool also lets you edit notes associated with each point. While the standard point description is limited to 32 characters, the drawing notes are not. When you click on a given point, you can add numerous lines of notes about that point in the bottom of the dialog. Keep in mind that these notes are stored in a separate file with the extension ".not" having the same name as the CRD and residing in the same folder.

Keyboard Command: EDITPT

Prerequisite: None



	Point#	Northing	Easting	Elevation	Description
1	1	79409.6709485	15565.2755448	1357.0000000	IP/EDGE ROAD
2	2	79257.0511942	15502.9397236	1452.0000000	T/H CL DITCH
3	6	79613.6619975	15619.7250234	1481.1700000	
4	7	79658.3581236	15636.0962271	1498.3700000	
5	8	79703.1481491	15652.5018241	1530.4500000	
6	9	79744.4638959	15667.6348696	1545.9700000	
7	45	79547.4889989	15488.9903904	1434.6000000	
8	46	79579.8843004	15500.8560738	1457.3500000	
9	47	79576.7856194	15499.7210954	1452.1500000	
10	48	79637.1629494	15521.8359777	1460.0500000	
11	49	79683.6431645	15538.8606539	1489.7300000	
12	50	79768.9977415	15570.1241501	1543.2000000	

	Point 1 Notes
1	A lengthy note about the first point goes here.
2	You can add as many lines as you would like.
3	

Edit Point Attributes

This command will edit the attributes of a TakeOff point such as the symbol type, point number, elevation and description. When this command is invoked, the command line will prompt the user: **Select point to edit (Enter**

to end). At this point, you can select any part of the point including the symbol, elevation, point number or the description. Next, a dialog will appear as shown.

To change the symbol, either type in a new symbol name in the edit box, or choose the "Select Symbol" button where you can choose from a list of symbols. To change any of the other properties of the point, simply change or replace the contents of the edit box with the new information. If you change the point number to a number that already exists in the current CRD file, and point protect is ON, you will be prompted **[O]verwrite w/new coordinates, overwrite [A]ll, or use number <1000>:.** You can choose to use the next available point number in the CRD file (this is the default) or overwrite the point number. The properties that you modify with this command will update the current CRD file and the screen entities.

You may also choose to use the AutoCAD *DDATTE* command to change the attributes of a point. If you do this, then the CRD file will not be updated and if you change the elevation attribute, the point will not change its current Z location.

Prerequisite: TakeOff points

Keyboard Command: EDITPNT

Erase Points

This command erases Carlson points inserts from the drawing. The points to erase can either be selected from the screen or specified by point number, point number range or by point group. Erasing a Carlson point will erase the three entities that make up a Carlson point: the point symbol, point attributes, and point node. There is an option to skip erasing the point symbol in case you want to leave the symbols in the drawing. The points may optionally be erased from the coordinate file. As long as the points are not deleted from the coordinate file, they can be redrawn with *Draw-Locate Points* or *Field-to-Finish.*

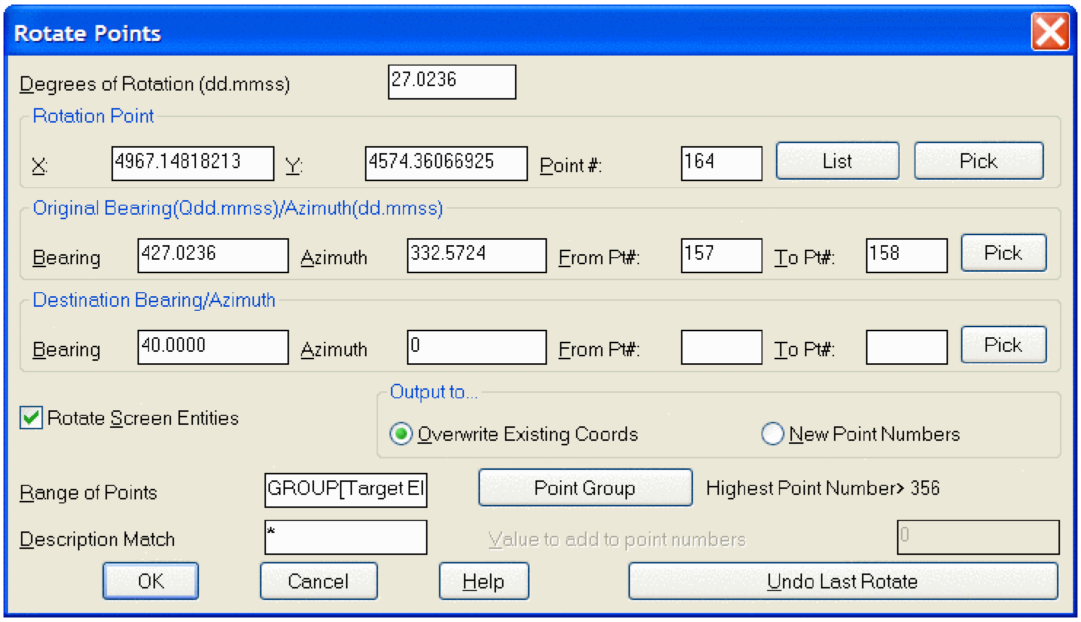
Prompts

Select points from screen, group or by point number [Screen/Group/<Number>]? *press Enter*
Point numbers to erase: *1-5*
Delete points from coordinate file [Yes/<No>]? *press Enter*
Delete point symbols [<Yes>/No]?*press Enter*
Erasing Carlson Points ....
Number of points erased> 5

Pulldown Menu Location: Points
Keyboard Command: DELPT
Prerequisite: Carlson points to be erased

Rotate Points

This command rotates points in a coordinate file. The degrees of rotation can be entered directly or calculated from original and destination bearings or azimuths.


Rotate Points

Degrees of Rotation (dd.mmss) 27.0236

Rotation Point

X: 4967.14818213 Y: 4574.36066925 Point #: 164

Original Bearing(Qdd.mmss)/Azimuth(dd.mmss)

Bearing 427.0236 Azimuth 332.5724 From Pt#: 157 To Pt#: 158

Destination Bearing/Azimuth

Bearing 40.0000 Azimuth 0 From Pt#: To Pt#:

☑ Rotate Screen Entities

Output to...

● Overwrite Existing Coords ○ New Point Numbers

Range of Points GROUP[Target El

Highest Point Number> 356

Description Match *

Value to add to point numbers 0

The **Rotation Point**will remain unchanged while the points specified for rotation rotate around it. This point can be specified by using the **List** button to pick from a list of points contained in the coordinate file, or from the screen by using the **Pick** button. The rotation point can also be defined by a coordinate value by manually entering in the X and Y values of the point. This point must be defined before the rotation will take place.

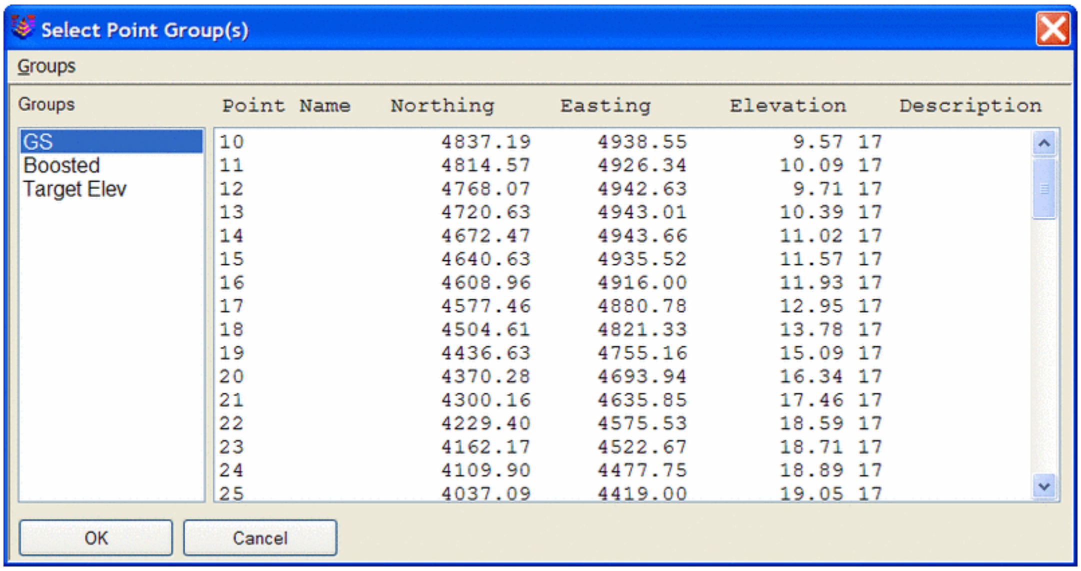
The **Original Bearings/Azimuths** and **Destination Bearings/Azimuths** can be entered directly or specified by point numbers. If using a pair of points to define the original bearing and then specifying the destination bearing by entering in the desired Bearing/Azimuth, the From and To Pt# fields should be left blank in the destination bearing/azimuth settings. Use the From and To Pt# fields in the Destination Bearing/Azimuth when you want to make a direction or Bearing/Azimuth between two existing points match the Bearing/Azimuth between two other existing points within the file. For example, to make the bearing between points 10-12 match the bearing between points 25-26, the Original Bearing/Azimuth could be defined as From Pt#10 To Pt#12 with the Destination Bearing/Azimuth defined as From Pt#25 To Pt#26.

With **Rotate Screen Entities** checked ON, after specifying the point range or group to rotate and selecting OK on the dialog box the following command line prompt is displayed:
Select objects to rotate (points excluded).:
At this prompt select the objects on the screen, polylines, lines, arc, etc., to also rotate and press enter. The rotation of the points and screen entities will be completed.

Various **Output** options for the rotated points are available.

Overwrite Existing Coordinates will overwrite the existing coordinate points with the new translation coordinates thus changing the coordinate values in the existing crd file.

New Point Numbers will assign new point numbers to the translated coordinate points and leave the original coordinate points unchanged and present in the coordinate file. When using this option, on the Range of Points to Translate dialog, there is a Value to add to point numbers field. In this field, enter the value to add to the point numbers. For example if the existing point numbers are 1-20, and the value to add is 100, the resulting new point numbers will begin at 101 and end at 120.



Point Name	Northing	Easting	Elevation	Description
10	4837.19	4938.55	9.57	17
11	4814.57	4926.34	10.09	17
12	4768.07	4942.63	9.71	17
13	4720.63	4943.01	10.39	17
14	4672.47	4943.66	11.02	17
15	4640.63	4935.52	11.57	17
16	4608.96	4916.00	11.93	17
17	4577.46	4880.78	12.95	17
18	4504.61	4821.33	13.78	17
19	4436.63	4755.16	15.09	17
20	4370.28	4693.94	16.34	17
21	4300.16	4635.85	17.46	17
22	4229.40	4575.53	18.59	17
23	4162.17	4522.67	18.71	17
24	4109.90	4477.75	18.89	17
25	4037.09	4419.00	19.05	17

Specifying the points to be rotated is accomplished either by specifying a Range of Points (1-20,33,36-40....) or by Point Groups. If using the Point Group option, the Select Point Group(s) dialog box will be displayed allowing for the selection of the Group(s) to rotate.

The **Description Match** option only rotates points with the description(s) specified in this field.

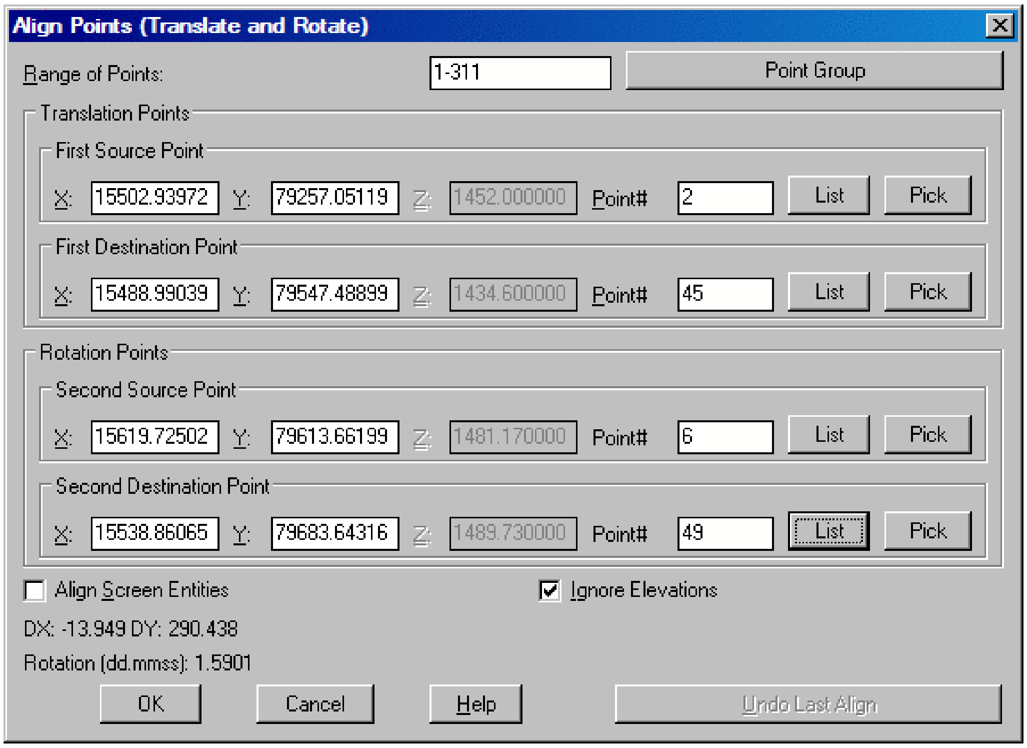
The points that have been specified for rotation that are present in the drawing will be graphically updated to their new location in addition to an automatic update of the coordinate file.

Undo Last Rotate restores the points to their previous location before rotation. It is important to note that if Rotate Screen Entities has been checked to restore the rotated objects to their previous location will require the use of the undo command located in the Edit pulldown.

Pulldown Menu Location: Points
Keyboard Command: rotatept
Prerequisite: points in a coordinate file

Align Points

This command translates a specified Range of Points or Points Group(s) based on a source point and destination point and then rotates to align the first source point and a second source point with the first destination point and a second destination point. The command basically combines the Translate and Rotate Point commands. To specify a Range of Points to align, enter the range to align or select a point group(s) by selecting the Point Group button. Each of the Translation and Rotation points, both Source and Destination points, can be entered manually or picked from the point list by selecting the List button.


Align Points (Translate and Rotate)

Range of Points: 1-311

Translation Points

First Source Point
X: 15502.93972 Y: 79257.05119 Z: 1452.000000 Point# 2

First Destination Point
X: 15488.99039 Y: 79547.48899 Z: 1434.600000 Point# 45

Rotation Points

Second Source Point
X: 15619.72502 Y: 79613.66199 Z: 1481.170000 Point# 6

Second Destination Point
X: 15538.86065 Y: 79683.64316 Z: 1489.730000 Point# 49

☐ Align Screen Entities ☑ Ignore Elevations

DX: -13.949 DY: 290.438

Rotation (dd.mmss): 1.5901

When **Align Screen Entities** is checked, after specifying the point range or group to align and selecting OK on the dialog box the following command line prompt is displayed:
Select objects to rotate (points excluded): At this prompt select the objects on the screen, polylines, lines, arc etc., to also align and press Enter. The alignment of the points and screen entities will be completed.

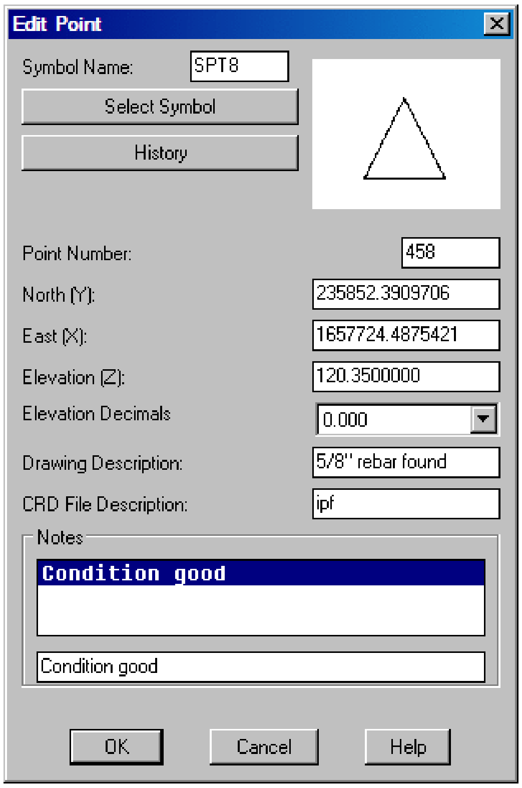
When **Ignore Zero Elevations** is checked, all points with an elevation of 0 will be ignored in the alignment.

Undo Last Align restores the points to their previous location before alignment. It is important to note that if Align Screen Entities has been checked to restore the aligned objects to their previous location will require the use of the undo command located in the Edit pulldown.

Pulldown Menu Location: Points
Keyboard Command: alignpt
Prerequisite: Points in a coordinate file

Edit Point Attributes

This command will edit the attributes of a Carlson point, such as the symbol type, point number, elevation and description. When this command is invoked, the command line will prompt the user: **Select point to edit (Enter to end).** At this point, you can select any part of the point including the symbol, elevation, point number or the description. Next, a dialog will appear as shown.



Symbol Name: SPT8

Point Number: 458

North (Y): 235852.3909706

East (X): 1657724.4875421

Elevation (Z): 120.3500000

Elevation Decimals: 0.000

Drawing Description: 5/8" rebar found

CRD File Description: ipf

Notes

Condition good

Condition good

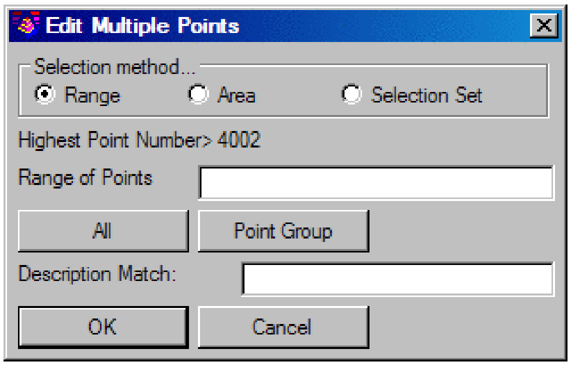
To change the symbol, either type in a new symbol name in the edit box, or choose the "Select Symbol" button where you can choose from a list of symbols. To change any of the other properties of the point, simply change or replace the contents of the edit box with the new information. Both Drawing Description and CRD File Descriptions are displayed. When a change to the Drawing description is made, this change will not be reflected in the coordinate file. This allows the change of a description that is defined in the Field to Finish (fld) table for a particular code. If a change is made in the CRD File description, it will be reflected in the coordinate file. Take note that if the CRD file description is changed, running Field to Finish will change the definitions for the point(s) changed. If you change the point number to a number that already exists in the current CRD file, and point protect is ON, you will be prompted **[O]verwrite w/new coordinates, overwrite [A]ll, or use number <1000>:.** You can choose to use the next available point number in the CRD file (this is the default), or overwrite the point number. The properties that you modify, with the exception of Drawing Description, will update the current CRD file. All modifications will update screen entities. Selecting the History button will bring up another dialog box that displays the point history of the point chosen. A history of the point will be listed, but only if, under General Setting, the Maintain CRD History File had been set to ON (selected) for the coordinate file that you are working with. With the CRD History feature of Carlson, all point changes can be rolled back.

You may also choose to use the AutoCAD *DDATTE* command to change the attributes of a point. If you do this, then the CRD file will not be updated and if you change the elevation attribute, the point will not change its current Z location.

Pulldown Menu Location: Points
Keyboard Command: editpnt
Prerequisite: Carlson points

Edit Multiple Pt Attributes

This function allows you to modify the properties of multiple point attributes at the same time. This command gives you complete control over the Carlson point attributes that are present in the drawing. Changes can be made to each attribute – the point number, elevation, description or symbol – all in one motion. For example, you could rotate the elevation text of some points to 45 degrees, change the height of the description text for all the points in the drawing, or change the layer for a particular attribute. Once this command is chosen, the entry Edit Multiple Points dialog, a smaller box, appears. Here you can determine your point selection method. There is also an option for description matching.


Edit Multiple Points

Selection method...
● Range ○ Area ○ Selection Set

Highest Point Number> 4002

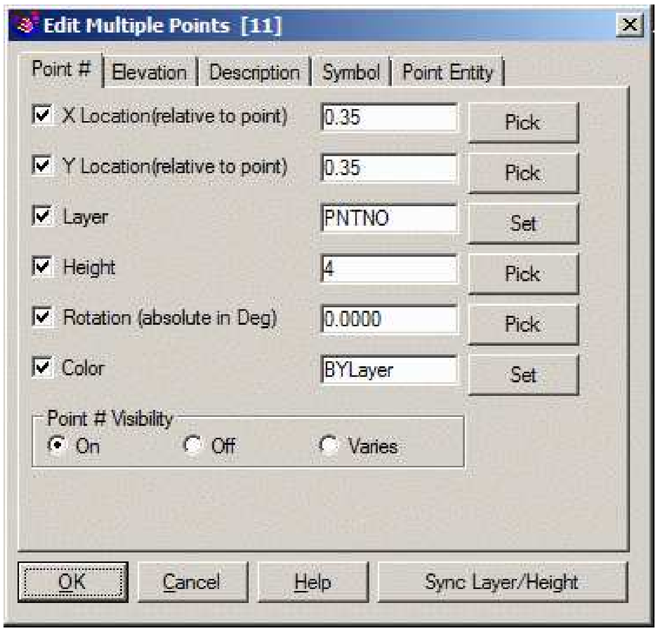
Range of Points

Description Match:

After the selection of the points to change, click OK, and the subsequent, larger Edit Multiple Points dialog boxes will appear. The number of points selected will be shown at the top of the dialog boxes.

Edit Multiple Points dialog

For each attribute, you can change any number of the properties, including the layer, height and rotation. These dialogs will reflect the current status of each attributes properties. If, for example, you select 10 points, and 5 of them have the elevation rotation set at 45 degrees, and the other 5 are set at 0 (zero) degrees, then the rotation edit field will say ∗varies∗ to let you know that the properties of the points you selected are not the same. Here is an example of the dialog box.


Edit Multiple Points [11]

☑ X Location(relative to point) 0.35

☑ Y Location(relative to point) 0.35

☑ Layer PNTNO

☑ Height 4

☑ Rotation (absolute in Deg) 0.0000

☑ Color BYLayer

Point # Visibility
● On ○ Off ○ Varies

The **X location** refers to the distance in the X direction from the center (or insertion point) of the point symbol. The **Y location** refers to the distance in the Y direction from the center (or insertion point) of the point symbol.

The **Layer** refers to the layer of the individual attribute, not the entire attribute block. To change the layer of the entire attribute block, use the **Attribute Block Layer** option. The **Height** is expressed in real units (generally feet or meters), not plotted size. The **Rotation angle** is expressed in absolute decimal degrees. The **Color** can be set ByLayer or to a specific color. The **Point Entity Layer** refers to the layer that the node of the point resides. The required layers can either be typed in manually, or the Select button can be used to pick from the existing layers in the drawing. If a new layer is desired, simply type in the name of the new layer and it will be created automatically. Use the layer property manager to edit the properties of this new layer, if required. The **Visibility** setting allows for attributes to be shown or hidden in the drawing.

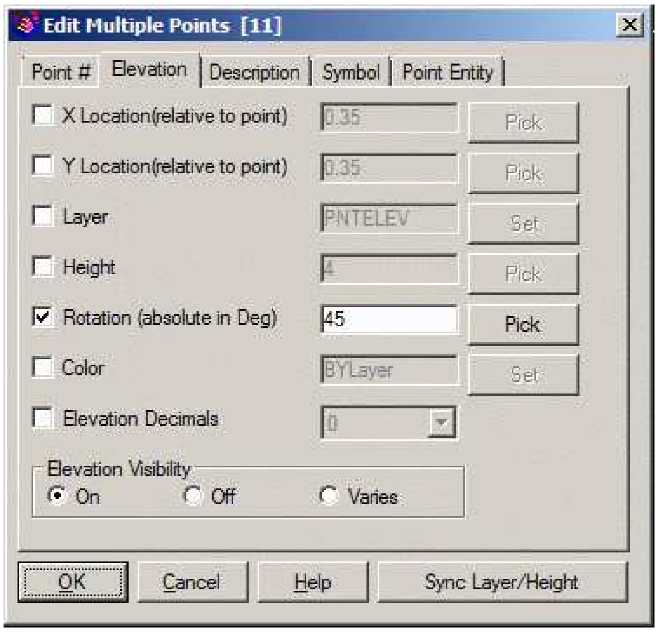
To change a point symbol, check on the **Symbol** tab and use the select button to choose the desired symbol. On the Point Entity tab, the **Attribute Layout ID** refers to the attribute layout style defined in Point Defaults or Field to Finish code definitions. This option allows you to change the particular layout with one of the other available styles or to a customized style if defined. The Pick buttons allow you to pick two points to define a distance (or angle in the case of Rotation). If you want to select a line to define a distance or angle, select two points on the line with the appropriate OSNAP.

Select the attribute to edit, make the necessary changes to this attribute and then move on to the next attribute if required. Changes made to the attributes are remember individually, which allows for switching back and forth though the attributes until the command is completed. After completion the new settings for the point attributes will be retained until changed or redrawn on the screen.

The **Sync Layer/Height** function sets the layer or height for some or all the attributes. The layer and height can be entered manually or pick an existing attribute to get the value.

Example sequential use of Edit Multiple Points dialog

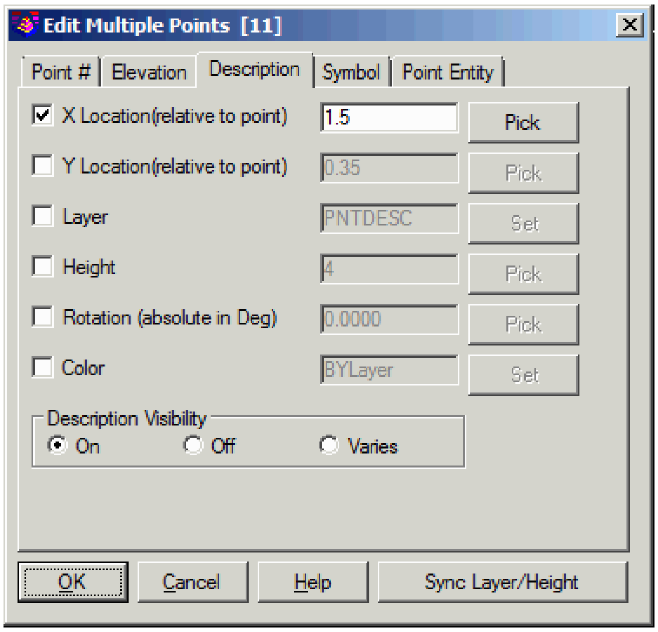
Again, the number of points selected will be shown in the dialog title. Let's now define the changes for each attribute individually. In the following example, suppose we want to rotate the elevation text to a 45 degree angle, move the description to the right and change the symbol. First, click on the Elevation for the Attribute to Edit. Now, select the Rotation option and type in 45. The dialog box should be as below.



☐ X Location(relative to point) 0.35 Pick
☐ Y Location(relative to point) 0.35 Pick
☐ Layer PNTELEV Set
☐ Height 4 Pick
☑ Rotation (absolute in Deg) 45 Pick
☐ Color BYLayer Set
☐ Elevation Decimals 0

Elevation Visibility
● On ○ Off ○ Varies

Now, select the Description option for the Attribute to Edit. Select the X location from the Items to Change. Enter 1.50 in the box. This value makes the description line up better with the rotated elevation. The dialog should be as below:

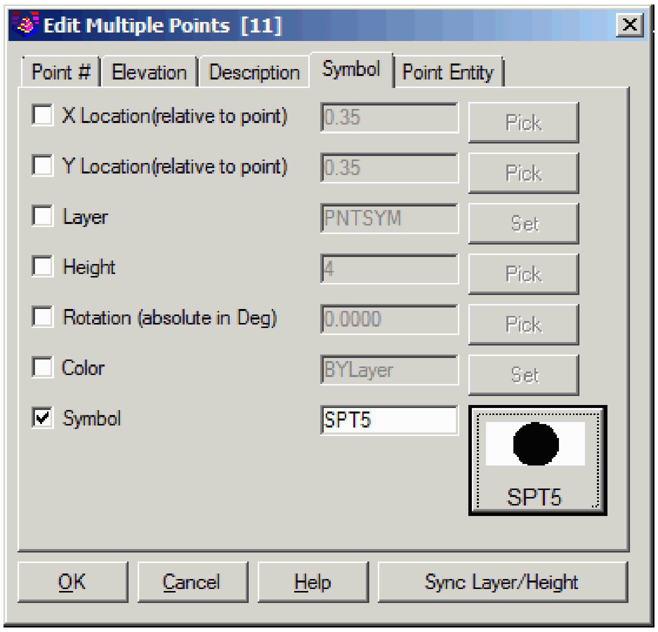

Edit Multiple Points [11]

☑ X Location(relative to point): 1.5
☐ Y Location(relative to point): 0.35
☐ Layer: PNTDESC
☐ Height: 4
☐ Rotation (absolute in Deg): 0.0000
☐ Color: BYLayer

Description Visibility
● On ○ Off ○ Varies

Point #
Elevation
Description
Symbol
Point Entity
Pick
Pick
Set
Pick
Pick
Set
OK
Cancel
Help
Sync Layer/Height

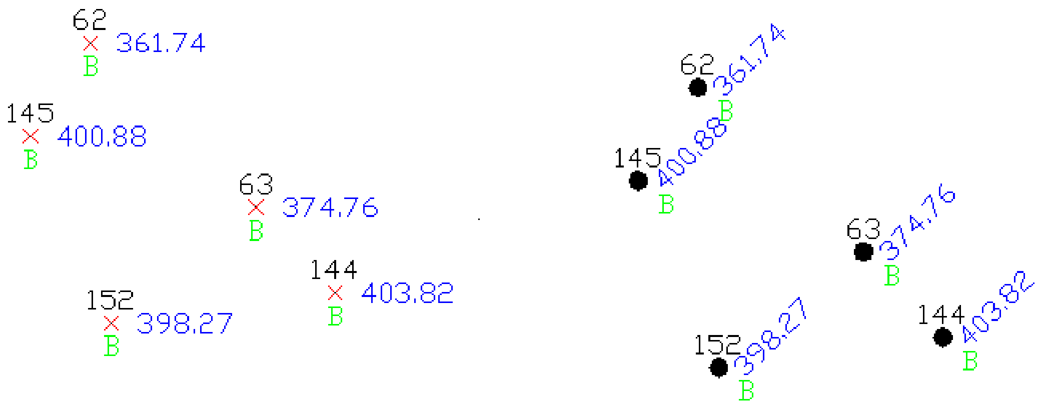
Now, for the final change, select the Symbol for the Attribute to Edit. We want to actually change the point symbol. To do this, toggle on the option to change the symbol by clicking in the box beside the word Symbol. Next, press the Select button and select symbol SPT5. The dialog should be as below:


Edit Multiple Points [11]

☐ X Location(relative to point): 0.35
☐ Y Location(relative to point): 0.35
☐ Layer: PNTSYM
☐ Height: 4
☐ Rotation (absolute in Deg): 0.0000
☐ Color: BYLayer
☑ Symbol: SPT5

Point #
Elevation
Description
Symbol
Point Entity
Pick
Pick
Set
Pick
Pick
Set
SPT5
OK
Cancel
Help
Sync Layer/Height

At this point we are ready to select the OK button to perform the changes. The following image shows the points before and after the changes.



Before and After Changes

Pulldown Menu Location: Points
Keyboard Command: modpnts
Prerequisite: Points drawn on the screen

Move Point Attributes Single

This command allows the user to move Carlson point attributes (including the point number, elevation or description) one at a time.

Prompts

Select Point Number, Elevation, or Description to Move: *select point attribute*

Pick new location: *pick point*

Pick new angle: *pick new angle or press Enter*

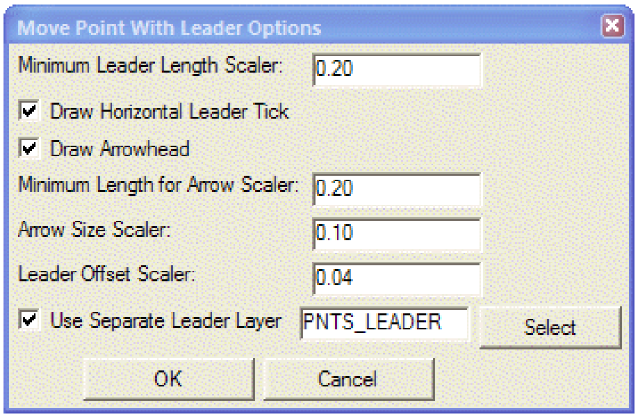
Pulldown Menu Location: Points
Keyboard Command: movepnt
Prerequisite: Carlson points

Move Point Attributes with Leader

This command allows the user to move Carlson point attributes (including the point number, elevation or description), and to draw a dynamic leader to the point node. Leaders and arrowheads may be customized by selecting Options at the command line. The attributes are always justified left or right depending on which side the leader starts.

Prompts

Select Point Label to Move (O for Options, R for Restore): *select point attribute*
Pick label position: *pick point*
Select another Point Label to Move (O for Options, R for Restore, Enter to End): *O*



Minimum Leader Length Scaler: 0.20

☑ Draw Horizontal Leader Tick

☑ Draw Arrowhead

Minimum Length for Arrow Scaler: 0.20

Arrow Size Scaler: 0.10

Leader Offset Scaler: 0.04

☑ Use Separate Leader Layer PNTS_LEADER

Minimum Leader Length Scaler: Specifies the minimum length, in terms of multiples of the attribute block's height, that the leader must be.
Draw Horizontal Leader Tick: Specifies whether or not to draw a terminating tick (a short horizontal line segment sometimes referred to as a "hook line").
Draw Arrowhead: Specifies whether or not to draw an arrowhead at the end of the leader that points to the point entity.
Minimum Leader for Arrow Scaler: Specifies the minimum length of the leader, in terms of multiples of the attribute block's height, that the leader must be before an arrowhead is placed on it.
Arrow Size Scaler: A scale factor to apply to resize the arrowhead symbol.
Leader Offset Scaler: A distance indicating the desired offset from the point node to the tip of the leader.
Use Separate Leader Layer: Specifies whether or not to use a layer other than that of the identified point for the leader. Use the **Select** button to choose an alternative layer for the leader.

Select another Point Label to Move (O for Options, R for Restore, Enter to End): *R*
Select Point Label to Restore: *pick label*

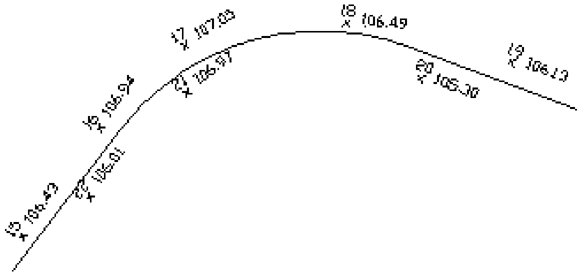
Pulldown Menu Location: Points
Keyboard Command: movepntleader
Prerequisite: Carlson points

Twist Point Attributes

This command will rotate the orientation of the text of Carlson point attributes (point #, elevation, description) and point symbols. The Twist Screen option aligns the point attributes to appear horizontal in the current twist screen. The Azimuth option allows you to enter an azimuth or pick two points to align the point attributes. The Entity Segment option aligns the point attributes by the selected line or polyline segment in the direction the entity is drawn. The Follow Polyline option aligns the point attributes by the polyline segment that is closest to the point.

Prompts

Twist by [<Twist screen>/Azimuth/Entity segment/Follow polyline]? *F*
Select reference polylines to follow. *pick a polyline*
Select objects: 1 found
Select objects:
Select points from screen, group or by point number [<Screen>/Group/Number]? *select Enter*
Select Carlson Software points.
Select objects: *pick the Carlson point inserts*


15 106.43
22 106.01
16 106.94
21 106.97
17 107.03
18 106.49
20 105.30
19 106.13

Point attributes aligned by Follow Polyline option of Twist Point

Pulldown Menu Location: Points
Keyboard Command: twistpts
Prerequisite: None

Resize Point Attributes

This command sets the size of the selected point attributes (point number, elevation, description) and point symbols. This command is similar to Scale Point Attributes, but instead of scaling the size by a factor, all the select points are set to the same specified size. Points can also be chosen based upon Point Groups.

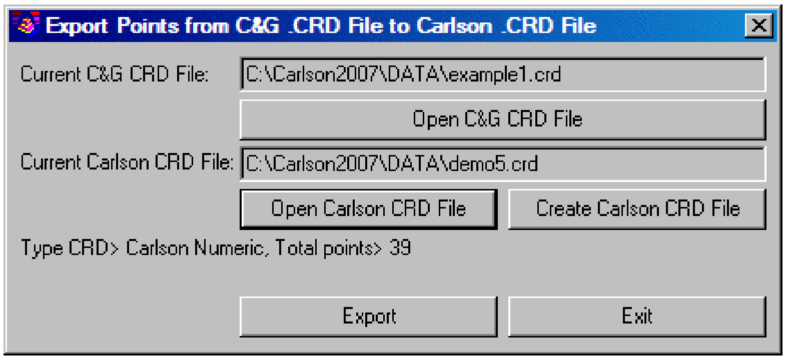
Prompts

Enter point attribute and symbol size <4.0>: *press Enter*
Scale symbols only, point labels only or both [Symbols/Labels/<Both>]? *press Enter*
Select points from screen, group or by point number [<Screen>/Group/Number]? *press Enter*
Select Carlson Software points.
Select objects: *pick the point entities*
Finding Carlson Software Point Attributes ....
Number of entities changed> 10

Pulldown Menu Location: Points
Keyboard Command: sizepnt
Prerequisite: Carlson points

Convert C&G to Carlson Points

This command converts C&G Points into a Carlson CRD file.


Export Points from C&G .CRD File to Carlson .CRD File
Open C&G CRD File
Open Carlson CRD File
Create Carlson CRD File
Export
Exit

Current C&G CRD File: C:\Carlson2007\DATA\example1.crd

Current Carlson CRD File: C:\Carlson2007\DATA\demo5.crd

Type CRD> Carlson Numeric, Total points> 39

Specify the existing C&G File to convert by selecting the Open C&G CRD File button. Specify the existing Carlson CRD file to write to, or the new Carlson CRD file to create, by selecting either Open Carlson CRD file or Create

Carlson CRD file. Press OK and the conversion is completed.

Pulldown Menu Location: Points > Convert Point Format
Keyboard Command: cg2crd
Prerequisite: A C&G point file

Convert Land Desktop to Carlson Points

This command converts Land Desktop point entities into Carlson format point entities. The Land Desktop Object Enabler from Autodesk is used to read the Land Desktop point entities. This object enabler must be installed before running this routine. The installation for the object enabler is located under Support at www.autodesk.com. Be sure to match the version of the object enabler with the Land Desktop version used to create the drawing.

Prompts

Convert all or selected points [All/<Selected>]? *all.* Choose which points to convert.
Point position method [Insertion/<Database>]? *press Enter.* Choose between the drawing insertion points or the point database for the point locations.
Locate points on Real-Z Axis [Yes/<No>]? *press Enter.* Choose between creating the points at their elevation or at zero.
Convert point markers to symbols [<Yes>/No]? *press Enter.* Choose between using a point symbol or the PDMODE.

Pulldown Menu Location: Points
Keyboard Command: ldd_crd
Prerequisite: LDT points in the drawing and the LDT Object Enabler

Convert Civil 3D to Carlson Points

This command converts Civil 3D point entities into Carlson format point entities. When running in AutoCAD, the Civil 3D Object Enabler from Autodesk is used to read the Civil 3D point entities. This object enabler must be installed before running this routine. The installation for the object enabler is located under Support at www.autodesk.com. When running in IntelliCAD, this routine uses a conversion program from the Open Design Alliance to read the Civil 3D point entities.

Pulldown Menu Location: Points > Convert Point Format
Keyboard Command: c3d_crd
Prerequisite: Civil 3D points in the drawing

Convert Softdesk to Carlson Points

This command converts Softdesk point blocks in the drawing to Carlson point blocks. These point block formats are similar and converting only requires reordering and renaming the attributes. Softdesk points can also be read into the current CRD file by using the command *Update CRD File from Drawing* in *Coordinate File Utilities,* this updates the CRD file without modifying the screen entities.

Pulldown Menu Location: Points > Convert Point Format
Keyboard Command: 2surv
Prerequisite: Softdesk points

Convert Leica to Carlson Points

This command converts LisCad or Leica point blocks in the drawing to Carlson point blocks. These point block formats are similar and converting only requires reordering and renaming the attributes. Leica points can also be read into the current CRD file by using the command *Update CRD File from Drawing* in *Coordinate File Utilities.* This updates the CRD file without modifying the screen entities.

Pulldown Menu Location: Points > Convert Point Format
Keyboard Command: 2surv3
Prerequisite: Leica points

Convert Eagle Point to Carlson Points

This command converts Eagle Point point blocks in the drawing to Carlson point blocks. These point block formats are similar, and converting only requires reordering and renaming the attributes. Eagle Point points can also be read into the current CRD file by using the command *Update CRD File from Drawing,* found in *Coordinate File Utilities.* This updates the CRD file without modifying the screen entities.

Pulldown Menu Location: Points > Convert Point Format
Keyboard Command: 2surv2
Prerequisite: Eagle Point points

Inquiry Menu 15

List

This command lists the object type, object layer, and*X*,*Y*,*Z* position relative to the current user coordinate system (UCS) and whether the object is in model space or paper space.

The List command reports color, linetype, and lineweight information if these items are not set to BYLAYER. The thickness of an object is displayed if it is nonzero. *Z* coordinate information defines the elevation. If the extrusion direction of the entry differs from the *Z* axis (0,0,1) of the current UCS, the List command also reports the extrusion direction in UCS coordinates. The List reports additional information related to the specific object selected.

Prompts

```
Command:
LIST
Select objects: 3 found, 1 group

Select objects:

BLOCK REFERENCE Layer: "PNTS"
Space: Model space
Handle = 1F3D
Group = ∗A1
"SPT4"
at point, X=6135023.7190 Y=2190074.2098 Z= 800.0000
X scale factor 5.0000
Y scale factor 5.0000
rotation angle 0d0'0"
Z scale factor 5.0000

BLOCK REFERENCE Layer: "PNTS"
Space: Model space
Handle = 1F4D
Group = ∗A1
"SRVPNO1"
at point, X=6135023.7190 Y=2190074.2098 Z= 800.0000
X scale factor 5.0000
Y scale factor 5.0000
rotation angle 0d0'0"
Z scale factor 5.0000

ATTRIBUTE Layer: "PNTNO"
Space: Model space
Handle = 1F4E
Style = "PTXT"
Font file = TXT
center point, X=6135023.7190 Y=2190077.9598 Z= 800.0000
height 5.0000
value 1
tag PT#
rotation angle 0d0'0"
width scale factor 1.0000
obliquing angle 0d0'0"
flags normal
```

```
generation normal

ATTRIBUTE Layer: "PNTELEV"
Space: Model space
Handle = 1F4F
Style = "PTXT"
Font file = TXT
start point, X=6135031.2190 Y=2190071.7098 Z= 800.0000
height 5.0000
value 800
```

Prerequisite: an entity

Keyboard Command: LIST

Point ID

This command reports complete information pertaining to a Carlson point. Although similar in function to the AutoCAD *ID* command, this routine is much more detailed. With this command, you are given the point number, as well as the northing, easting and elevation coordinates. You also are given the point description, and you are shown the name and the location of the coordinate file for the point.

Prompts

Pick point or point number: *255*

```
PointNo.  Northing(Y)  Easting(X) Elev(Z)   Description
255       4379.83      4265.48    19.01     GROUND/SHOT
N: 4379.83  E: 4265.48  Z: 19.01
PT#: 255  CRD File: c:\Carlson2008\data\mantopo.crd
```

Pulldown Menu Location: Inquiry
Keyboard Command: PT_ID
Prerequisite: None

Layer ID

This command reports the layer name of the selected entity.

Prompts

Pick entity to read layer: *pick an entity*
Layer: FINAL
Pick entity to read layer: *press Enter to end*

Pulldown Menu Location: Inquiry
Keyboard Command: layerid
Prerequisite: None

Layer Report

This command generates a report containing all the layers defined in the drawing. Along with the layer names, the report includes the number of entities on each layer, and the color, linetype and lineweight for each layer.

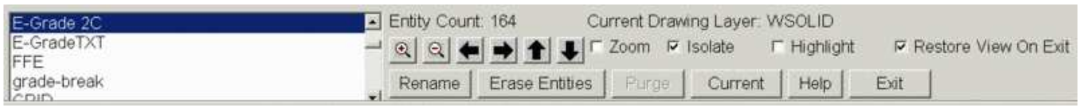
```
Layer Report
Drawing: C:\sample\example1

Layer Name                Entity Count  Color   Linetype     Lineweight
0                         5             White   CONTINUOUS
AREA_PERIM                0             White   CONTINUOUS
AREATXT                   0             Magenta CONTINUOUS
BL                        8             White   DASHED
BL-LAB                    76            Red     CONTINUOUS
```

Pulldown Menu Location: Inquiry
Keyboard Command: reportlayer
Prerequisite: None

Layer Inspector

This command is used to inspect and work with layers in the drawing. This command is ideal when you are working on a very dense and complex drawing which has many layers and you want to review the entities on different layers. In some cases, there will be layers that you would want to erase. Another scenario might be that you'd like to highlight a layer that is hard to find and see.

The Layer Inspector command has a dialog that docks to the bottom of the drawing window which keeps the drawing window visible while running the command. On the left of the dialog is a list of all the layers in the drawing. To inspect a layer, highlight the layer name from this list. You can inspect multiple layers at a time by selecting multiple layers in the list using the Shift and Ctrl keys while picking in the list. When a layer is selected, the Entity Count reports how many entities in the drawing are set to that layer. The Zoom toggle will zoom the drawing window to the extents of the entities on the layer. The Isolate toggle will freeze all other layers. The Highlight toggle will highlight all the entities on the layer. The Restore View On Exit will set the drawing window to the original position when Layer Inspector was started. The magnify and arrow buttons are used to zoom in/out and pan the drawing window. The Rename button allows you to rename the layer. The Erase Entities button will erase all the entities on the layer. The Purge button will purge the layer from the drawing which is only available when there are no entities on the layer. The Current button sets the layer as the current layer for the drawing.



E-Grade 2C
E-GradeTXT
FFE
grade-break

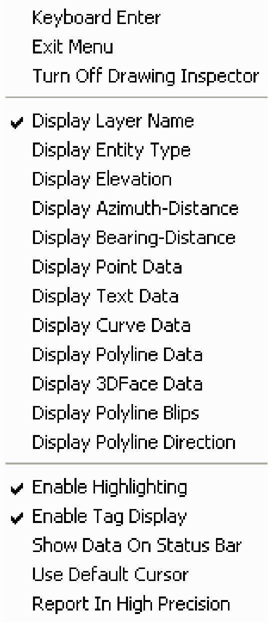
Entity Count: 164
Current Drawing Layer: WSOLID

☐ Zoom ☑ Isolate ☐ Highlight ☑ Restore View On Exit

Pulldown Menu Location: Inquiry
Keyboard Command: layer_inspect
Prerequisite: None

Drawing Inspector

This command reports object properties to you as you move the cursor over an entity. You can simply move the pointer over an entity and the selected property will be displayed either in a pop-up window next to the pointer and/or on the status bar, depending on the selected option. Drawing Inspector is a transparent command that can run while other commands are running. Once Drawing Inspector is started, it will stay active even while running other commands until you turn it off. To turn off Drawing Inspector, run the command again to toggle it off by pick Drawing Inspector from the Inquiry pull-down menu or from the toolbar or by typing the command name, or right-click and choose Turn off Drawing Inspector. The options for this command are set in the menu that pops up by clicking the right mouse button. The available properties are: Layer Name, Elevation, Azimuth-Distance, Bearing-Distance, Point Data, Text Data, Curve Data, 3D Face Data, Polyline Data and Polyline Blips.

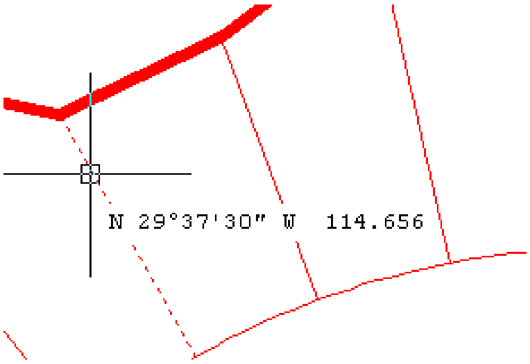

Keyboard Enter
Exit Menu
Turn Off Drawing Inspector
✓ Display Layer Name
Display Entity Type
Display Elevation
Display Azimuth-Distance
Display Bearing-Distance
Display Point Data
Display Text Data
Display Curve Data
Display Polyline Data
Display 3DFace Data
Display Polyline Blips
Display Polyline Direction
✓ Enable Highlighting
✓ Enable Tag Display
Show Data On Status Bar
Use Default Cursor
Report In High Precision

In the *Drawing Inspector* menu, you can choose one or more properties to display.

Display Layer Name: Allows you to display the layer name of the entity.
Display Entity Type: Allows you to display the type of the entity (ie. TEXT or POLYLINE).
Display Elevation: Allows you to display the elevation of the entity.
Display Azimuth-Distance: Allows you to display the azimuth and distance of a line.
Display Bearing-Distance: Allows you to display the bearing and distance of a line.
Display Point Data: Allows you to display the coordinate data of point.
Display Text Data: Allows you to display the attributes of text.
Display Curve Data: Allows you to display the radius, arc length, chord length and delta angle of a curve.
Display Polyline Data: Allows you to display the end point elevations, horizontal distance, slope distance and slope ratios.
Display 3D Face Data: Allows you to display the Z elevations at the face corners.
Display Polyline Blips: Allows you to displays temporary blip plus marks at the vertice locations of polylines.
Display Polyline Direction: Allows you to displays temporary arrows to show the direction of polylines.

In the *Drawing Inspector* menu, you can also choose how the property information is reported.

Enable Highlighting: Allows you to highlight the object that the *Drawing Inspector* is reporting.
Enable Tag Display: Enables you to view the information next to the cursor on the screen.
Show Data On Status Bar: Enables you to view the information on the status bar, in the lower corner of the screen.
Use Default Cursor: When enabled, only the drawing cursor shows. When disabled, the mouse pointer is also shown.
Report In High Precision: When enabled, displays 8 decimals on distance and 4 decimal seconds on angles.



Example of Drawing Inspector reporting
Bearing-Distance using the Tag Display

Pulldown Menu Location: Inquiry
Keyboard Command: inspector
Prerequisite: None

List Elevation

This command displays the elevation of a polyline or line. With a 3D polyline, the elevation ofthe 3D polyline at the pick point is reported along with the elevation of each vertex. See also,the *Drawing Inspector* command on the ∗Inq-Set∗ menu.

Prerequisite: an entity

Keyboard Command: LSTELEV

Distance Report

This command reports the horizontial distance, slope distance, and elevation difference between two points.

Prompts

```
Pick point or enter point number:
(409375.0 207039.0 0.0)
Pick second point or enter point number:
(409400.0 207082.0 0.0)
Horiz Dist: 49.73 Slope Dist: 49.73 Elv Diff: 0.00
```

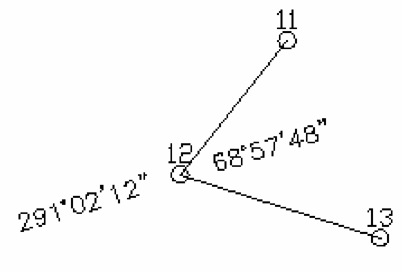
Prerequisite: none

Keyboard Command: distrprt

Angle Info

This command reports the interior and exterior angles defined by two joining line segments or by three points. The coordinates, angles and distances of the line segments are also reported. The report is display in the standard report viewer.

```
Angle Information
              Point#    Northing     Easting

Start Point:  11        4728.73      5660.09

Corner Point: 12        4684.89      5624.99

End Point:    13        4664.02      5690.60

              Bearing        Distance

First Side:   S 38°40'56'' W  56.16

Second Side:  S 72°21'16'' E  68.85

Interior: 68°57'48''

Exterior: 291°02'12''
```



Prompts

Define angle by, Points/<select line or polyline>: *P for points*
1st Point?
Pick point or point number: *11*
2nd (Corner) Point ?
Pick point or point number: *12*
3rd Point?
Pick point or point number: *13*
Interior: 68°57'18" Exterior: 291°02'42"
Angle Info Report Viewer
1st Point (Enter to end)?
Pick point or point number: *press Enter*

Pulldown Menu Location: Inquiry
Keyboard Command: ainfo
Prerequisite: None

Find Point(s)

This command can be used to find a point in the current CRD file with a certain point number or description. For example, if you entered RAD∗ the command would plot a preview arrow at all the points that have the letters RAD as part of the description. i.e. RADPT1, RADPT2, RADPT3, etc. This command is not case sensitive (test is considered the same as TEST). Matching points are highlighted on the graphics screen with the preview arrow and listed on the text screen.

Prompts

Find by point [N]umber or [D]escription <N>: *press Enter*
Point number or range of point numbers to find <1>: *8*10*
8 4856.75 4747.20 0.00
9 4909.25 4648.37 0.00
10 4223.30 4545.46 0.00 RADPT

If you respond with *D* for the first prompt the program prompts:
Conforms to AutoCAD's wild card matching.
Point Description(s) text to search for <>: *rad**
Searching file C:\Carlson/DATA/LOT.CRD for point descriptions matching RAD* ...
7 4817.02 4662.73 0.00 RADPT
10 4223.30 4545.46 0.00 RADPT
Point(s) found 2

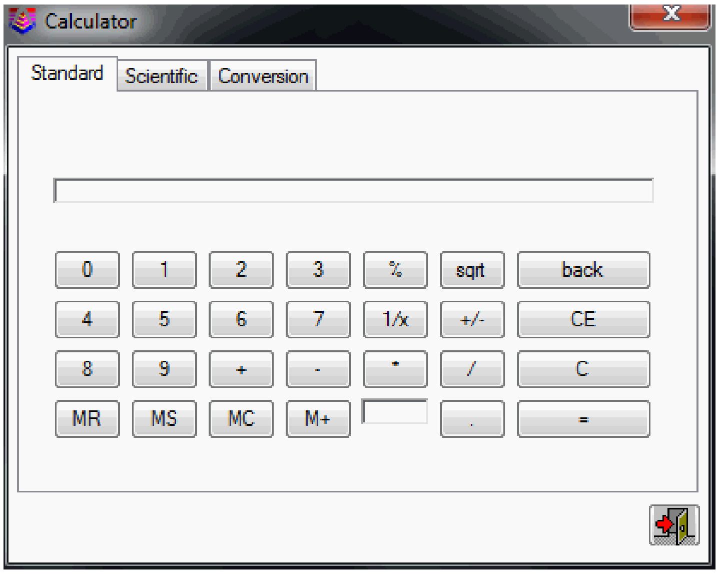
Pulldown Menu Location: Inquiry
Keyboard Command: fpnt
Prerequisite: None

Calculator

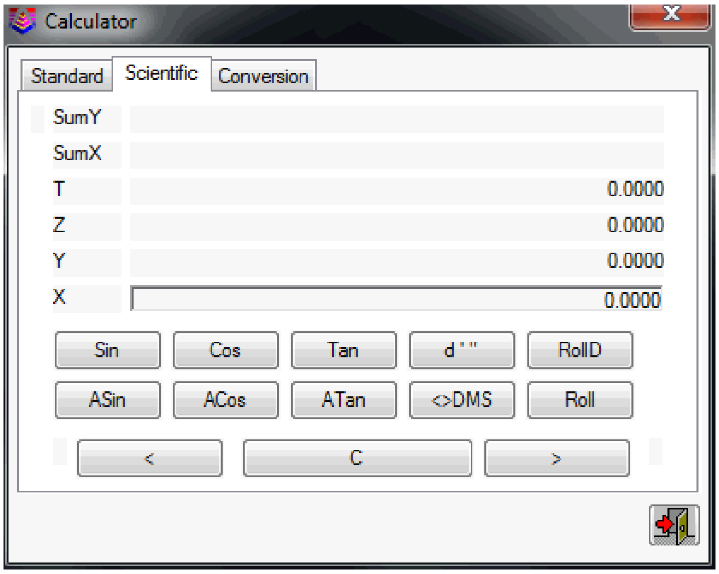
The Carlson Calculator command uses a convenient pop-up calculator with three tabs for a standard calculator, scientific calculator and conversion calculator. The standard calculator does basic math calculations using expressions such as +, -, / and *. The scientific calculator has angle and other functions. The conversion calculator has feet-metric and angle conversions including radians. The standard and scientific calculators support RPN. Here is how RPN works:
1+2 = 3
- type value 1 + Enter
- type value 2 + Enter
- type +

X = 3.

Standard Calculator
Most basic calculations can be performed using this tab in the calculator. Memory functions are also available.

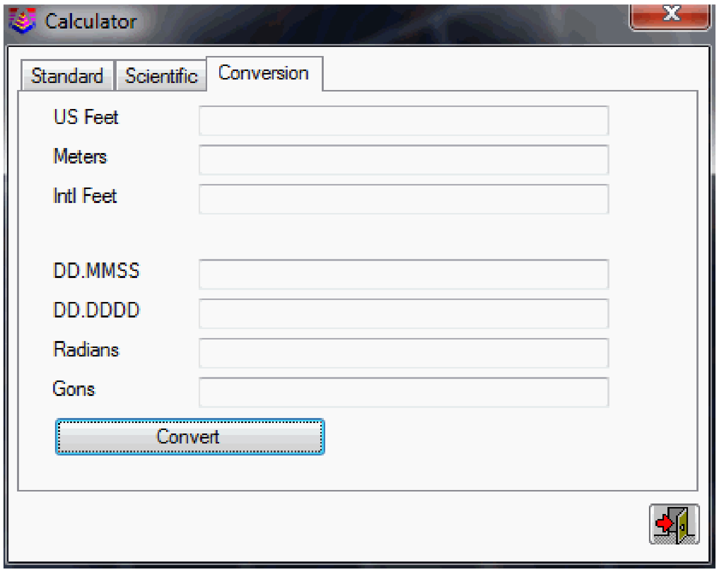


Scientific Calculator
Values can be entered on the X register. The values can be rolled up and down with the up and down arrow keys and the Roll and RollD buttons on the dialog. The Enter key finishes the entry of a number and pushes the stack. The C on the touch screen clears an entry. Additional functions on the screen can be obtained through touching the scroll [<] and [>] area of the screen.


Calculator
Standard
Scientific
Conversion
SumY
SumX
Sin
Cos
Tan
d ' "
RollD
ASin
ACos
ATan
<>DMS
Roll
<
C
>

T 0.0000
Z 0.0000
Y 0.0000
X 0.0000

Conversion Calculator
This mode provides for conversion between many units. Enter a value in any field and press Enter to find the conversion value. The following units are available in Feet, Meters and International Feet Degrees, Minutes, Seconds and Gons/Grads and Decimal Degrees.


Calculator
Standard
Scientific
Conversion
US Feet
Meters
Intl Feet
DD.MMSS
DD.DDDD
Radians
Gons
Convert

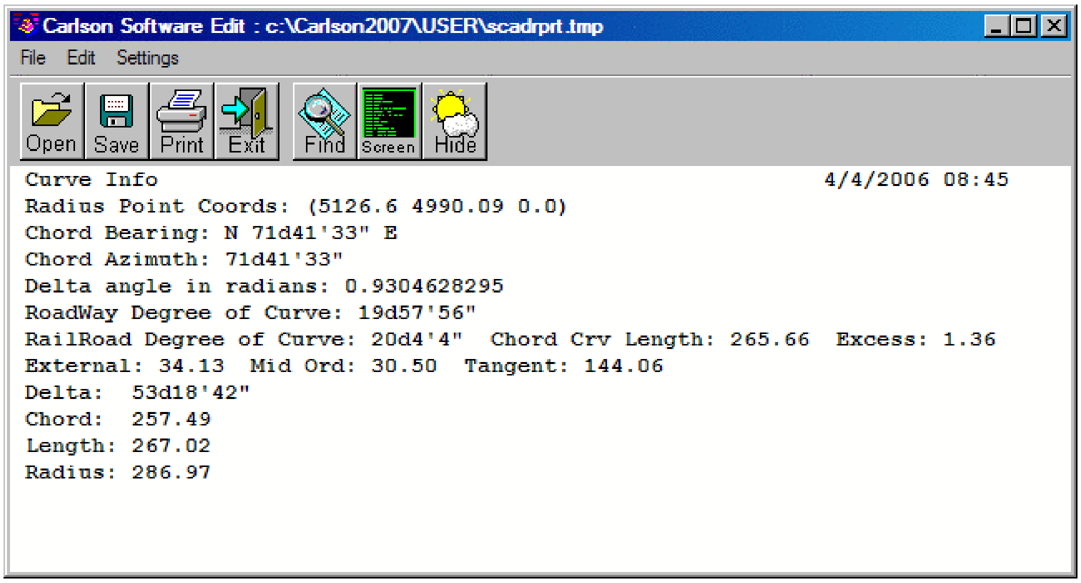
Pulldown Menu Location: Inquiry
Keyboard Command: cscalc
Prerequisite: None

Curve Info

This command displays information about a curve/arc. The curve can be defined by an arc entity or polyline arc segment or by selecting three points on the arc. The three points can be defined by point number or picked on the screen. The curve data is displayed in the text window with an option to be displayed in the Standard Report Viewer. Click Exit to return to the graphics window.

Prompts

Define arc by, Points/<select arc or polyline>: *select the arc entities*
Endpoint: (4923.81 5193.15 0.0)
Other Endpoint: (5168.27 5274.03 0.0)
Radius Point Coords: (5126.6 4990.09 0.0)
Chord Bearing: N 71d41'33" E
Chord Azimuth: 71d41'33"
Delta angle in radians: 0.9304628295
RoadWay Degree of Curve: 19d57'56"
RailRoad Degree of Curve: 20d4'4" Chord Crv Length: 265.66 Excess: 1.36
External: 34.13 Mid Ord: 30.50 Tangent: 144.06
Delta: 53d18'42"
Chord: 257.49
Length: 267.02
Radius: 286.97
Display curve data in report viewer [Yes/<No>]? *Y*



```
Curve Info                                                  4/4/2006 08:45
Radius Point Coords: (5126.6 4990.09 0.0)
Chord Bearing: N 71d41'33" E
Chord Azimuth: 71d41'33"
Delta angle in radians: 0.9304628295
RoadWay Degree of Curve: 19d57'56"
RailRoad Degree of Curve: 20d4'4"  Chord Crv Length: 265.66  Excess: 1.36
External: 34.13  Mid Ord: 30.50  Tangent: 144.06
Delta:  53d18'42"
Chord:  257.49
Length: 267.02
Radius: 286.97
```

Pulldown Menu Location: Inquiry
Prerequisite: None
Keyboard Command: cinfo

Polyline Info

This command reports the length and elevation of the selected polyline or line.

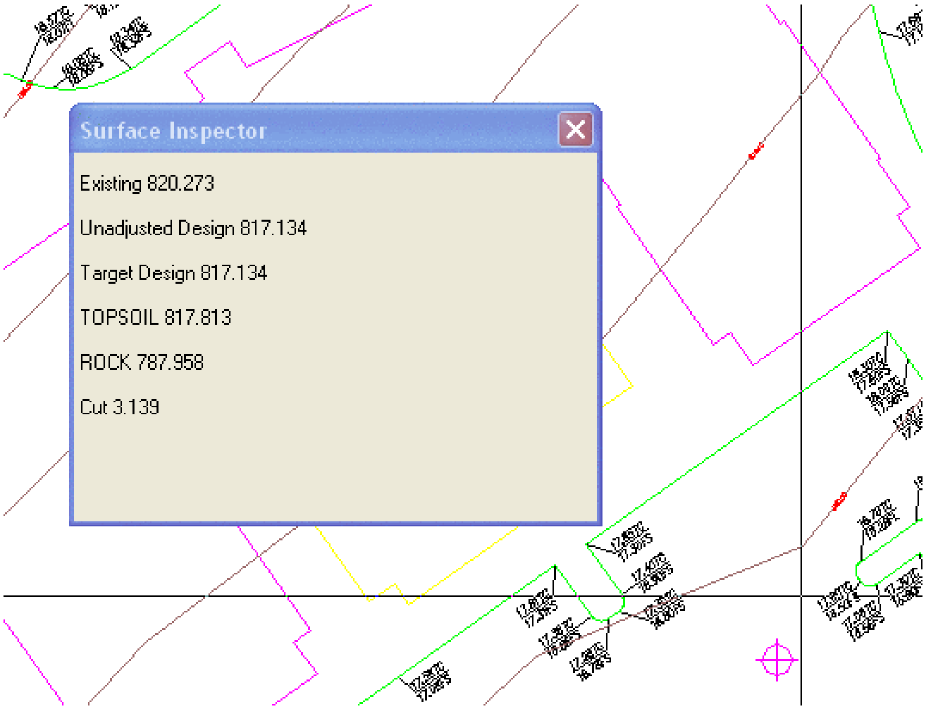
Prompts

Pick Polyline or Line: *pick a polyline or line*
Polyline length: 7702.75 Slope distance: 7702.75 Avg elev: 1700.00 Avg slope: 0.00%

Pulldown Menu Location: Inquiry
Keyboard Command: polylen
Prerequisite: None

Surface Inspector

This command allows you to report and optionally label elevations from your drawing. You can analyze all of your different surface files at one time. After running the command, Surface Inspector will begin showing you real-time elevations for each surface as you move the cursor on the screen. If you pick a point or enter coordinates, the elevation will be labeled along with the surface name.



Existing 820.273

Unadjusted Design 817.134

Target Design 817.134

TOPSOIL 817.813

ROCK 787.958

Cut 3.139

Surface inspector shows you real-time elevations as you move the cursor over your surface.

Prerequisite: Surface Model (s)
Keyboard Command: surfvals

Surface Report

This command reports a variety of information on each of your different surfaces. This is useful for checking for bad data and the file names of your surfaces. An example is below.

Surface Report 3/10/2005 15:34

Max Cut: 18.327 at 409269.984,207196.674
Max Fill: 1.943 at 409389.586,207248.866

Original Ground After Topsoil Removal
File: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo3-ex.flt
Date Modified: Thu Feb 10 10:02:05 2005
File Size: 64,028
Points: 259, Edges: 744, Triangles: 486

```
Min Z: 184.000 at 409299.790,206879.287
Max Z: 210.000 at 409571.562,207177.240

Design With Subgrade and Topsoil Replacement
File: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo3-fn.flt
Date Modified: Thu Feb 10 10:02:08 2005
File Size: 153,038
Points: 609, Edges: 1,779, Triangles: 1,171
Min Z: 176.000 at 409357.096,206821.604
Max Z: 206.000 at 409551.532,207185.124

Original Ground Before Topsoil Removal
File: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo3-og.flt
Date Modified: Thu Feb 10 10:02:05 2005
File Size: 64,028
Points: 259, Edges: 744, Triangles: 486
Min Z: 184.000 at 409299.790,206879.287
Max Z: 210.000 at 409571.562,207177.240

Design Without Subgrade or Topsoil Replacement
File: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo3-bs.flt
Date Modified: Thu Feb 10 10:02:08 2005
File Size: 153,038
Points: 609, Edges: 1,779, Triangles: 1,171
Min Z: 176.000 at 409357.096,206821.604
Max Z: 206.000 at 409551.532,207185.124

Design With Subgrade
File: C:\Documents and Settings\Todd Carlson\Desktop\Takeoff\Drawings\demo3-zn.flt
Date Modified: Thu Feb 10 10:02:08 2005
File Size: 153,038
Points: 609, Edges: 1,779, Triangles: 1,171
Min Z: 176.000 at 409357.096,206821.604
Max Z: 206.000 at 409551.532,207185.124
```

Prerequisites: A Surface
Keyboard Command: SURF_STATS

Bearing & Distance

This command reports the slope distance, slope ratio, bearing, azimuth and vertical angle between two 3D points. Pick or enter the coordinates of two points or select a line or polyline segment to calculate between the segment endpoints.

Prompts

Specify bearing-distance from (Line/PLine/<Points>)? *press Enter*
Pick point or enter point number: *pick a point*
Pick second point or enter point number: *pick a point*
Horiz Dist: 233.4 Slope Dist: 233.4 Elev Diff: 0.0 Vert Ang: 0d0'0"
Slope: 0.0% 0.0:1 Bearing: S 71d15'37" W Azimuth: 198d44'23"

Pulldown Menu Location: Inquiry
Keyboard Command: 3DIST

Prerequisite: None

Label Angle

Function

This command will label and report the interior and exterior angles between two directions. The angles can be defined by three points or by two line or polyline segments that have a common endpoint.

Prompts

Define angle by, Points/<select line or polyline>: *pick a polyline segment*

Select adjoining line or polyline: *pick another polyline segment*

Interior: 72d39'46" Exterior: 287d20'14"

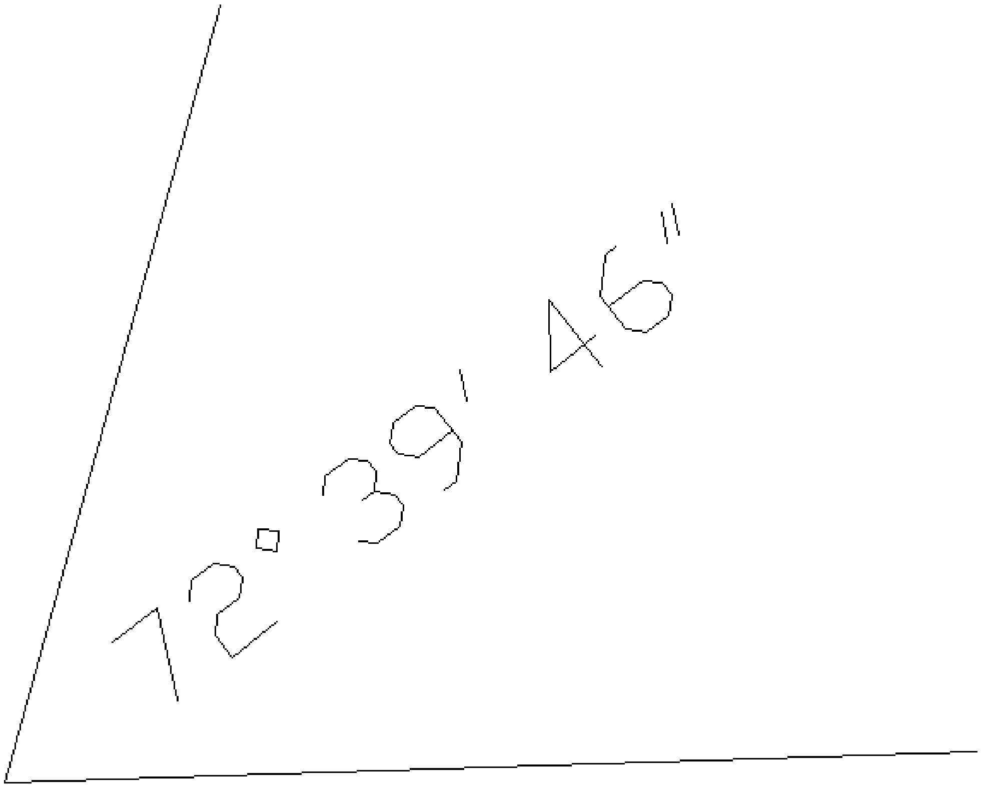
Angle to label (<Interior>/Exterior/None)? *press Enter*

Define angle by, Points/<select line or polyline>: *press Enter to end*

Pull-Down Menu Location: Annotate

Prerequisite: None

Keyboard Command: labang



Polyline Report

Function

This command generates a report of bearing-distance and curve data for all the point along the selected polyline. The closure is reported between the starting and ending points of the polyline. The polyline area is also reported. After executing the command, by pressing O for options, report deflection angles can be turned on by selecting Y for yes at the prompt. The deflection angle will be displayed in the report along with the bearing and distance of the polyline segments.

Prompts

Starting station <0.0>: *Press Enter*

Options/Select polyline to report: *pick a polyline*

Standard Report Viewer Displays the report for the selected polyline.

Options/Select polyline to report (Enter to End): *Press Enter*

Keyboard Command: plreport

Pull-Down Menu Location: Tools, Polyline Tools

Prerequisite: a polyline

```
Polyline Report 05/22/2002 13:24 >
NORTHING EASTING STATION BEARING DISTANCE
5790.690 4088.812 0.000
N 49°52'11" E 455.737
6084.426 4437.259 455.737
RADIUS: 367.183 LENGTH: 725.711 CHORD: 613.228 DELTA: 113°14'28"
CHORD BRG: S 73°30'35" E PC-R: S 40°07'49" E PT-R: S 73°06'39" W
RADIUS POINT: 5803.685,4673.919
5910.360 5025.265 1181.448
S 16°53'21" E 851.945
5095.161 5272.774 2033.393
S 52°00'05" W 548.996
4757.175 4840.152 2582.389
N 54°19'05" W 857.964
5257.614 4143.257 3440.353
RADIUS: 695.425 LENGTH: 430.350 CHORD: 423.516 DELTA: 35°27'23"
CHORD BRG: N 72°02'46" W PC-R: S 35°40'55" W PT-R: S 00°13'33" W
RADIUS POINT: 4692.743,3737.624
5388.163 3740.364 3870.702
N 40°52'52" E 532.394
5790.690 4088.812 4403.097
Closure Error Distance> 0.000
Total Distance> 4403.097
Polyline Area: 1201606.5 sq ft, 27.59 acres
```

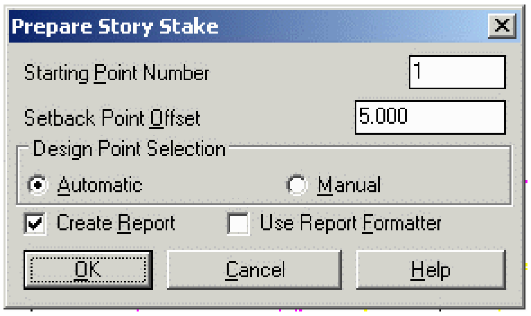
Story Stake From Surface Entities

This command creates points with cut/fill information stored in the note fields for the points. Beginning at a point and facing a specified direction, the cut/fill information describes a design surface that is defined by contours and

3D polylines in the drawing.

First, there is a dialog to set the starting point number, setback offset, selection mode and report options. The Automatic selection mode will create a story point for each crossing linework. The Manual mode will show the crossings and let you pick which ones to report.

The program prompts you to pick the starting point followed by a direction point. Then the intersections for all the contours and 3D polylines between these two pointsare calculated and the resulting horizontal distances and slopes are shown in a dialog. In this dialog, you can edit, add or remove these slopes descriptions. The Point Description can also be specified. When OK is clicked, a point in the coordinate file is created at the starting point with this information stored in the note file. An offset point is also created at the specified offset distance back from the starting point. At the end of Story Stake, a report of all the created points and the corresponding cut/fill data is shown if the Create Report option was set. Story Stake does not draw the points in the drawing. These points can be drawn using the Draw-Locate Points command.



Prepare Story Stake

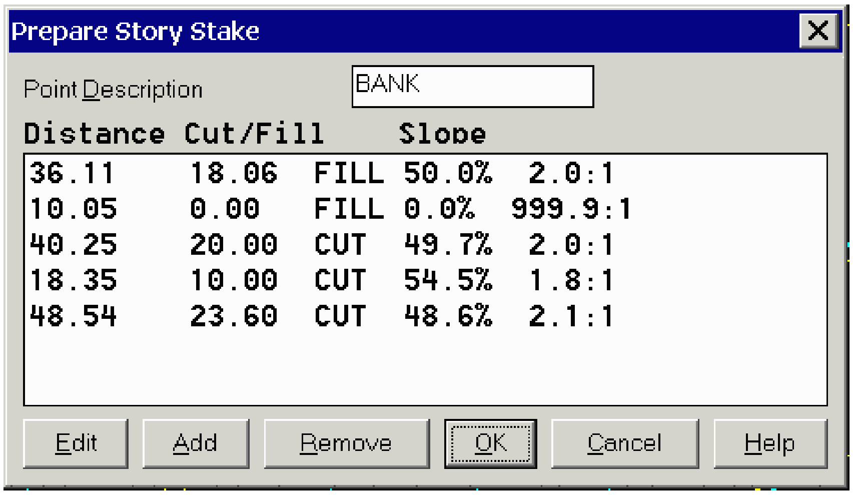
Starting Point Number: 1

Setback Point Offset: 5.000

Design Point Selection

● Automatic ○ Manual

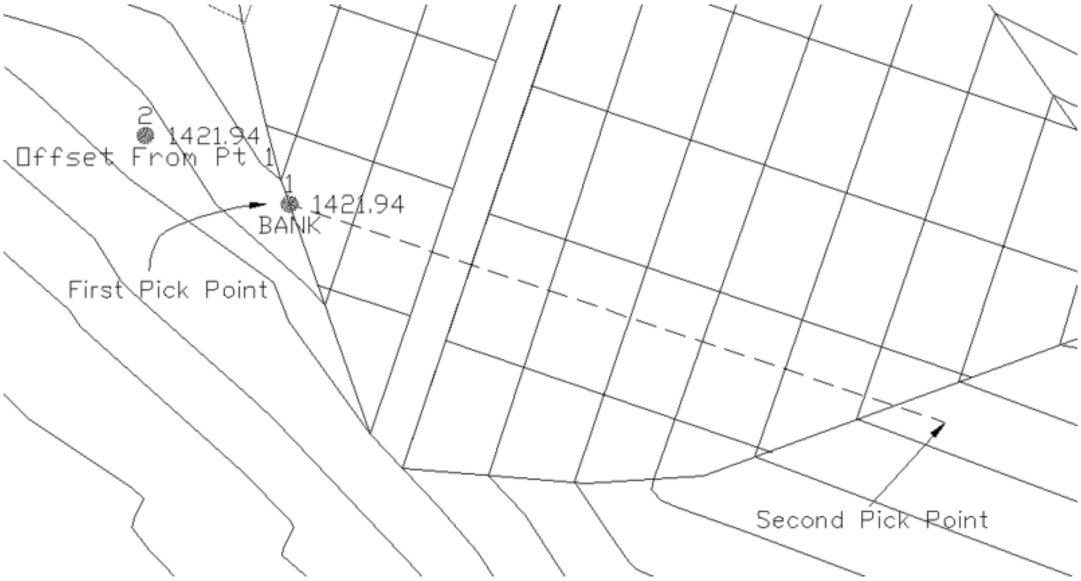
☑ Create Report ☐ Use Report Formatter



Prepare Story Stake

Point Description: BANK

```
Distance Cut/Fill     Slope
36.11     18.06   FILL 50.0%  2.0:1
10.05     0.00    FILL 0.0%  999.9:1
40.25     20.00   CUT  49.7%  2.0:1
18.35     10.00   CUT  54.5%  1.8:1
48.54     23.60   CUT  48.6%  2.1:1
```

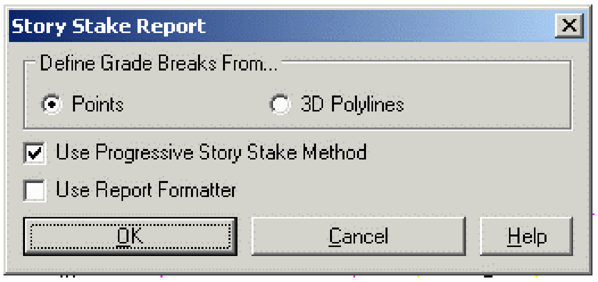


Story Stake By Points/Polyline

Function

This command creates a story stake report of distances, slope and cut/fill between selected points or along a selected 3D polyline.

First, there is an options dialog. The Progressive method reports each distance from the previous point to the next. The non-progressive method reports the distances from the starting point to each point. The report formatter option lets you customize the fields for the report and output the report to Excel.



Story Stake Report

Define Grade Breaks From...

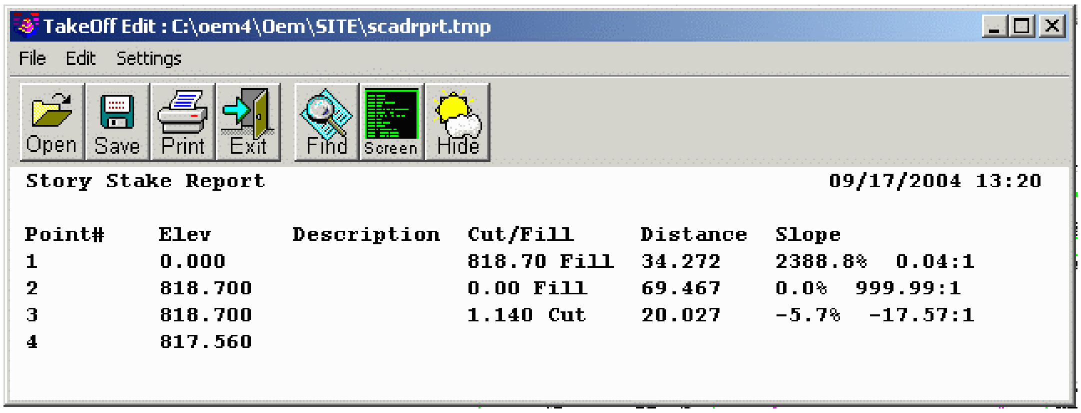
● Points ○ 3D Polylines

☑ Use Progressive Story Stake Method

☐ Use Report Formatter

For the points method, there are prompts at the command line to pick the points. The points should be picked one at a time in series from start to end. The points can be entered by point number from the current coordinate file or by screen pick.

For the polyline method, there is a prompt to select the 3D polyline for the grade. The polyline should be drawn in the order of the story stake.

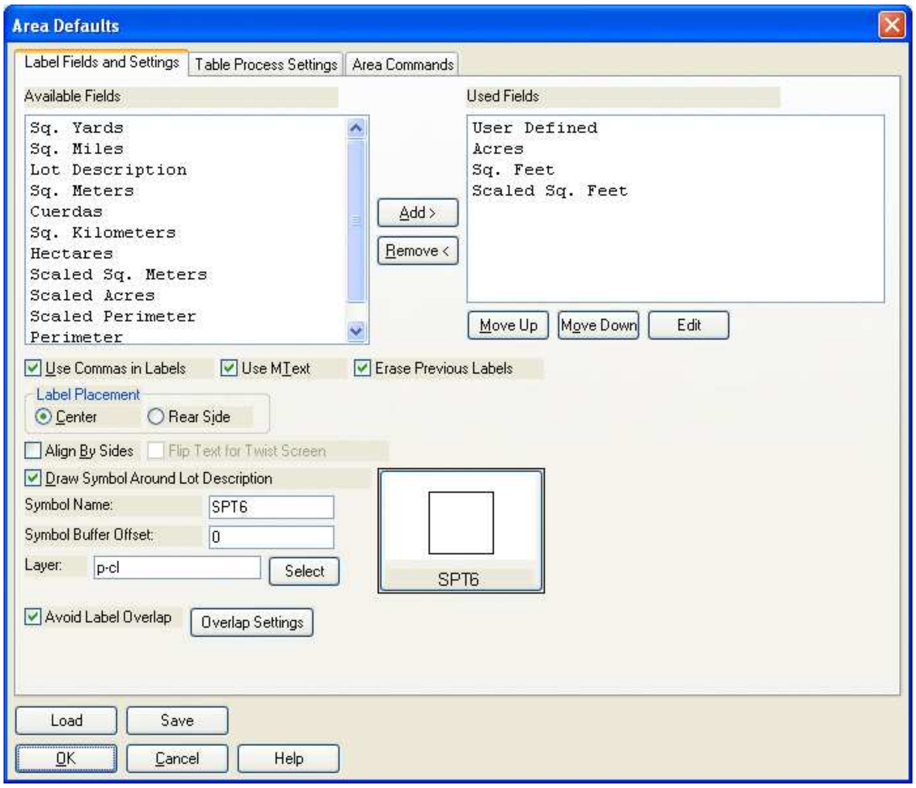


```
Story Stake Report                                      09/17/2004 13:20

Point#    Elev      Description  Cut/Fill     Distance  Slope
1         0.000                  818.70 Fill  34.272    2388.8%  0.04:1
2         818.700                0.00 Fill    69.467    0.0%  999.99:1
3         818.700                1.140 Cut    20.027    -5.7%  -17.57:1
4         817.560
```

Area Defaults

This command allows you to specify default settings for area labeling. The Area Defaults dialog is divided into 3 tabs. The first is the Label Fields and Settings tab. The top portion of the Label Fields and Settings tab contains two listboxes which are used to control which of the possible ten area fields will be used for area labeling. You use the Add and Remove buttons to control which fields will be included in area labels. You can also add to the Used Fields list by double-clicking on items in the Available Fields list. The area label will include the values in the order as specified in the Used Fields listbox. To change the order you use the Move Up and Move Down buttons.

When a grid projection is defined in Drawing Setup, the Available Fields with include geodetic areas where the areas are adjusted by the projection. The Base Z from Drawing Setup is used for the elevation factor for this adjustment.


Area Defaults

Label Fields and Settings | Table Process Settings | Area Commands

Available Fields:
- Sq. Yards
- Sq. Miles
- Lot Description
- Sq. Meters
- Cuerdas
- Sq. Kilometers
- Hectares
- Scaled Sq. Meters
- Scaled Acres
- Scaled Perimeter
- Perimeter

Used Fields:
- User Defined
- Acres
- Sq. Feet
- Scaled Sq. Feet

☑ Use Commas in Labels ☑ Use MText ☑ Erase Previous Labels

Label Placement: ● Center ○ Rear Side

☐ Align By Sides ☐ Flip Text for Twist Screen

☑ Draw Symbol Around Lot Description

Symbol Name: SPT6

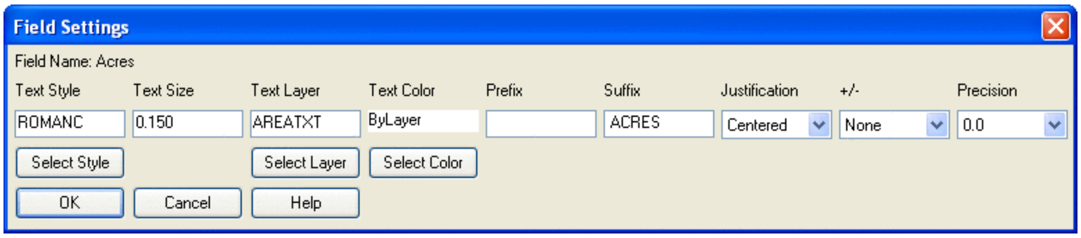
Symbol Buffer Offset: 0

Layer: p-cl

☑ Avoid Label Overlap

Add >
Remove <
Move Up
Move Down
Edit
Select
SPT6
Overlap Settings
Load
Save
OK
Cancel
Help

Field Settings Dialog: To control the appearance of the fields in the drawing, use the Edit button to edit the highlighted item in the Used Fields list, or double click on a field in the same list. This will call up the Field Settings Dialog.


Field Settings

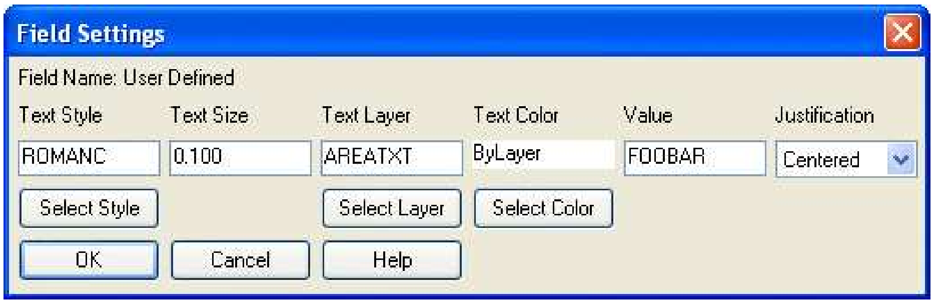
Field Name: Acres

Text Style	Text Size	Text Layer	Text Color	Prefix	Suffix	Justification	+/-	Precision
ROMANC	0.150	AREATXT	ByLayer		ACRES	Centered	None	0.0

Select Style
Select Layer
Select Color
OK
Cancel
Help

User Defined: The Field "User Defined" can be added to place a custom fixed label in all areas. To control the value and appearance of the custom label in the drawing, use the Edit button to edit the "User Defined" item in the Used Fields list, or double click on a field in the same list. This will call up the Field Settings Dialog. In this case the "Value" setting becomes the custom label.

Scaled labels: The "Scaled Sq. Feet", "Scaled Sq. Meters", "Scaled Acres" and "Scaled Permiter" fields can be used to include area labels that are scaled based on Drawing Setup "Report Scale Factor".


Field Settings

Field Name: User Defined

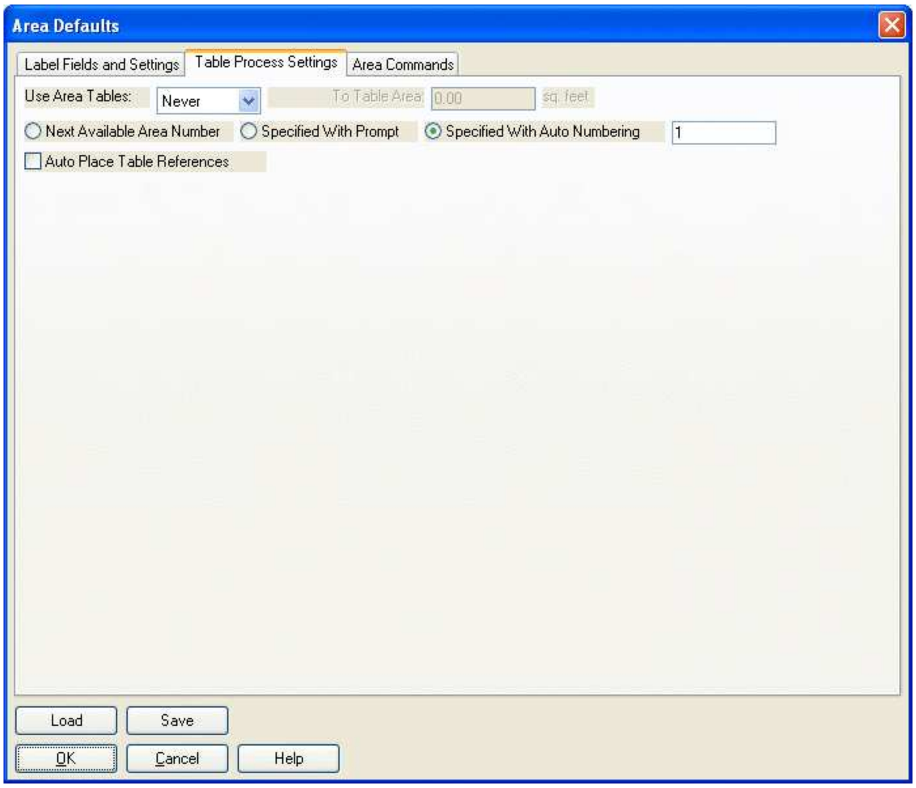
Text Style	Text Size	Text Layer	Text Color	Value	Justification
ROMANC	0.100	AREATXT	ByLayer	FOOBAR	Centered

Select Style
Select Layer
Select Color
OK
Cancel
Help

Text Style: This allows you to set a text style for the area labels. You can enter the name manually or use the Select Style button to call up a dialog which presents a list of known text styles.
Text Size: This value is multiplied by the horizontal scale to obtain the actual text size.
Text Layer: This allows you to assign a layer for the area text. You can enter the name manually or use the Select Layer button to call up a dialog which presents a list of known layers.
Text Color: This allows you to to assign a color for the area text. Use the Select Color button to call up the standard color picker dialog. To use the default for the Text Layer, select ByLayer.
Prefix and Suffix: Although most area labeling uses the suffix, as in 1.25 Acres or 3.515 Hectares. But for those who prefer a prefix, as in Ac: 1.25, this routine can create that area labeling style automatically (see below for example of results of using a prefix with square feet and acres).
Justification: Use this to control whether the label field is left, centered or right justified.
+/-: This allows you to display + or - in the Prefix or Suffix of the area labels, or choose None.
Precision: Choose precision level for the currently selected field.

Below the Available and Used Fields lists the following items for further controlling area label generation:

Use Commas in Labels: This allows you to use commas in the area labels.
Use MText: Check this box to turn on the use of MText for area labels. If this is checked all area labels will be grouped into as few MText entities as possible. Area labels with different text styles, justification or layers will not be combined into the same MText entity.
Erase Previous Labels: When checked, previous area labels for the area being relabeled will be erased.
Label Placement: When auto placement of area labels is used, the labels can be placed either at the centroid of area or at the rear side. This is accomplished by selecting either the Center or Rear Side radio button, respectively. When Center is selected the user can choose to have the labels oriented according to the side lines of the area by checking the Align By Sides checkbox. When either Align By Sides or Rear Side is selected, the checkbox Flip Text for Twist Screen can be selected to have the label rotated 180 degrees to present it in the best reading orientation relative to the current Twist Screen rotation setting.
Draw Symbol Around Lot Description: When the Lot Description field is included in the Used Fields list, the user can check this checkbox to have a symbol drawn around the Lot Description field. When this box is checked, you specify the symbol name in the **Symbol Name** field or click on the current symbol (drawn to the right) to graphically choose the desired symbol. You specify the layer by entering the name in the **Layer** box or by clicking on the **Select** button to choose from a dialog that presents all known layers.
Symbol Buffer Offset: By default, the symbol will be automatically scaled according to the text length and size of the Lot Description value for the area. For additional control of symbol scaling, the user can enter a number in text size units in the Symbol Buffer Offset box. This value will be added to the automatically generated default scaling value.
Avoid Label Overlap: If this box is checked the area labels will be checked for overlaps after they are generated. Please see the Overlap Manager documentation for more information.
Overlap Settings: Click this button to go to the Avoid Label Overlaps dialog where you can review or modify the Overlap Manager settings. Please see the Overlap Manager documentation for more information.



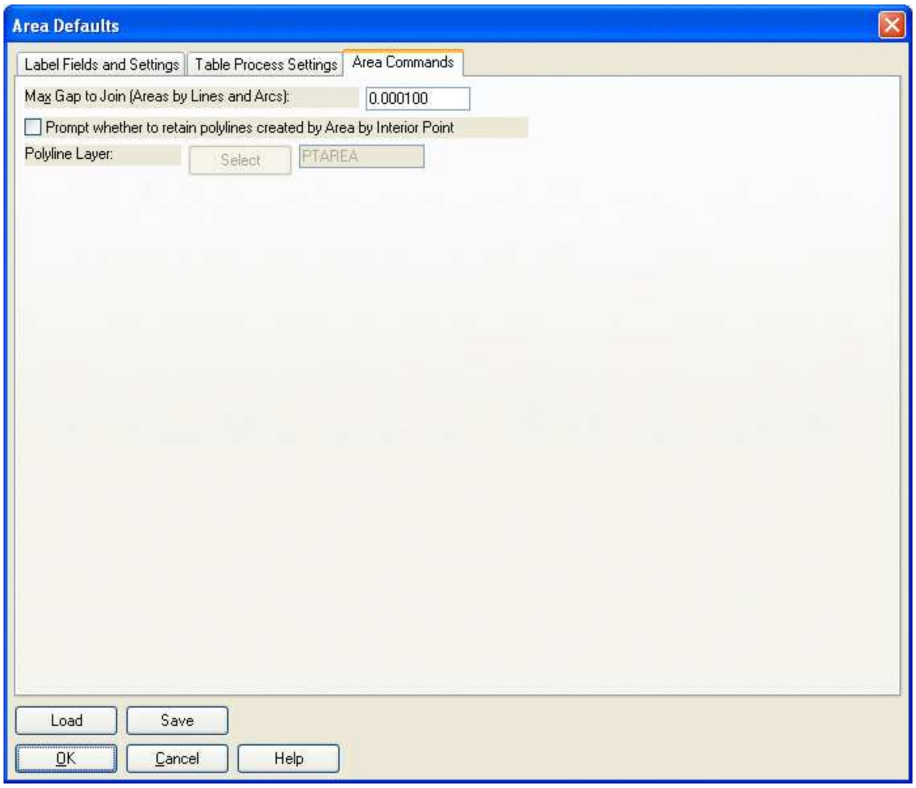
Use Area Tables: Never

To Table Area: 0.00 sq. feet

○ Next Available Area Number ○ Specified With Prompt ● Specified With Auto Numbering 1

☐ Auto Place Table References

Table Process Settings Tab:
Use Area Tables: Use this control to determine whether area labels are sent to a table or not. Options are "Never", "Always" or "By Scaler".
To Table Area: When the user has selected "By Scaler" in the "Use Area Tables" list this item is enabled. When "By Scaler" is selected and the area is less than this minimum, the area label is sent to a table.
Area Reference Numbering: There are three different methods for setting the reference number: **Next Available** will automatically use the lowest available number. **Specified With Prompt** will prompt you for a number for each area. **Specified with Auto Numbering** will automatically use the lowest available number starting with the specified number.
Auto Place Table References: When checked, will automatically place the area reference label according to the settings for the area labels as specified in the Label Field and Settings tab (see above). Otherwise you will be prompted to pick each label location manually.



Max Gap to Join (Areas by Lines and Arcs): 0.000100

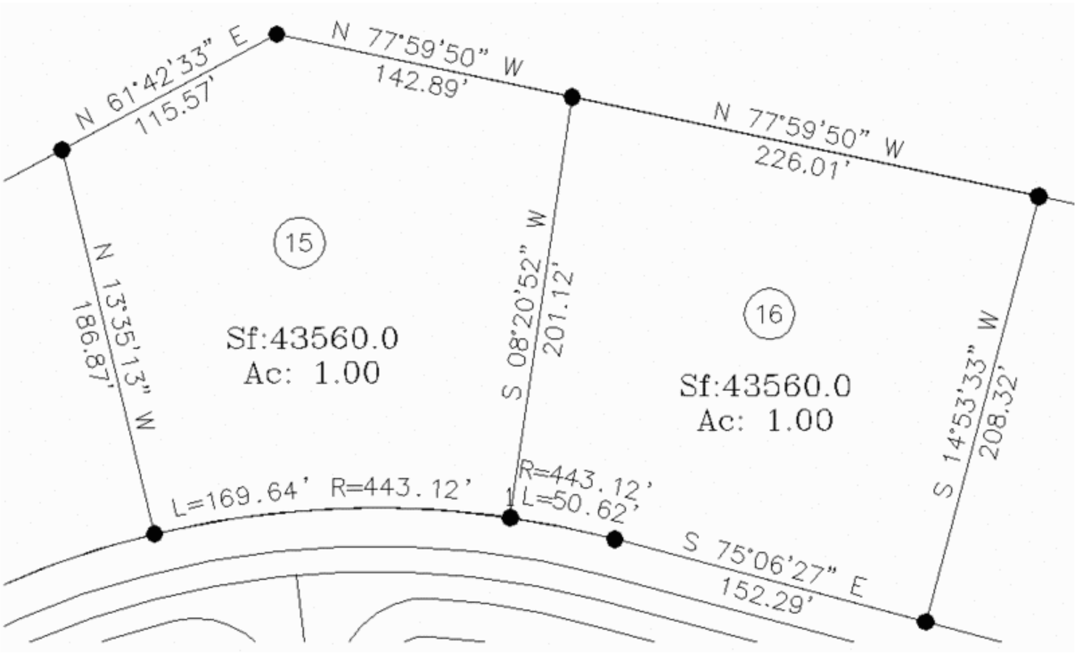
☐ Prompt whether to retain polylines created by Area by Interior Point

Polyline Layer: PTAREA

Area Commands Tab:
Max gap to join: You use this option during *Area by Lines & Arcs* command. When connecting lines and arcs that define the perimeter, the program will join endpoints if the distance between the two points is less than the specified gap. Otherwise the program will report an error and will not report an area.
Prompt whether to retain polylines created by Area by Interior Point: When checked the user will be asked whether to retain the polylines created by the "Area by Interior Point" command.
Polyline Layer: Will be enabled when "Prompt whether to retain polylines created by Area by Interior Point" is checked to allow the user to select the layer that any such created polylines will be placed in.

Load/Save: These buttons save and recall all the Area Default settings to a .ARS settings file.

Tip: Keep in mind that changes in Area Defaults, if changed from the Area/Layout pulldown menu, only apply to that work session. If changed within the Configure command, the changes apply to all new work sessions as well.


N 61°42'33" E
115.57'
N 77°59'50" W
142.89'
N 77°59'50" W
226.01'
15
16
N 13°35'13" W
186.87'
S 08°20'52" W
201.12'
S 14°53'33" W
208.32'
Sf:43560.0
Ac: 1.00
Sf:43560.0
Ac: 1.00
L=169.64' R=443.12'
R=443.12'
L=50.62'
S 75°06'27" E
152.29'

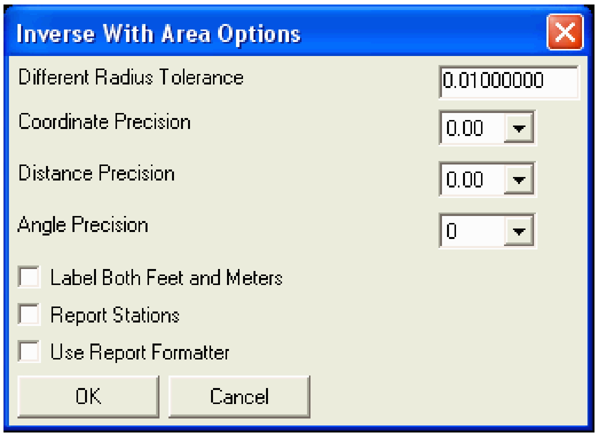
The results of using a prefix with square feet and acres

Pulldown Menu Location: Area/Layout
Keyboard Command: defarea
Prerequisite: None

Area By Inverse

This command generates a report of the angle and horizontal distance between a series of points, and calculates the area of the closed figure defined by the points. Curve data can also be entered and reported. The points can be either picked on the screen, or entered by point number. You can also enter a range of point numbers (i.e. 1-9). The closure is reported using the total distance inversed, and the difference between the starting and ending points, as the closure error.

At the first command prompt, you can enter O for Options to bring up the command options. The Different Radius Tolerance checks that the distance between the PC and radius point and the PT and radius point match for curves. There is an option to report the distances in both feet and meters. The Use Report Formatter chooses between the standard report or customizing the report. You can also set the decimal precisions for the report and whether to report stations for the distances along the perimeter.



Inverse With Area Options

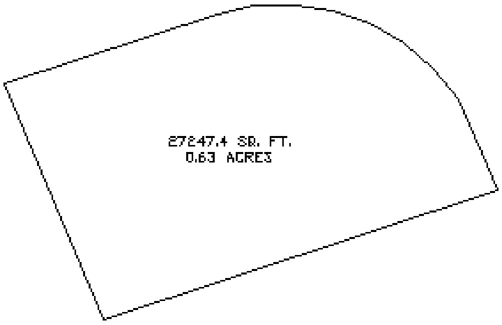
Different Radius Tolerance: 0.01000000
Coordinate Precision: 0.00
Distance Precision: 0.00
Angle Precision: 0

☐ Label Both Feet and Meters
☐ Report Stations
☐ Use Report Formatter

The area can be labeled in the drawing using the settings from the *Area Defaults* command. If you don't want to label the area, press Enter at the pick label point prompt. This command creates a polyline of the figure which can be erased or kept in the drawing.

Prompts

Options/<Pick Starting point or point number>: *pick a point*
Pick point or point numbers (R-RadiusPt,U-Undo,Enter to end): *pick a point*
Pick point or point numbers (R-RadiusPt,U-Undo,Enter to end): *R* for radius
Radius point number or pick point: *pick a point*
Curve direction [Left/<Right>]? *press Enter*
Pick End of Arc or point number (U-Undo,Enter to end): *pick a point*
Pick point or point numbers (R-RadiusPt,U-Undo,Enter to end): *pick a point*
Point number (R-RadiusPt,U-Undo,Enter to end): *pick a point*
Point number (R-RadiusPt,U-Undo,Enter to end): *pick a point*
Point number (R-RadiusPt,U-Undo,Enter to end): *press Enter*
SQ. FEET: 27247.4 SQ. YARDS: 3027.5 SQ. MILES: 0.0
ACRES: 0.63 PERIMETER: 668.35
Pick area label centering point: *pick a point*
Erase Polyline Yes/No <Yes>: *press Enter* The command plots a polyline that represents the figure you defined if you want to keep the polyline respond with No.



```
Inverse with Area
CRD File> c:\data\newplat.crd
PNTNO  BEARING       DISTANCE  NORTHING  EASTING  STATION  DESC
903                            4940.73   2490.40  0.00     StartPt        S 48°43'58'' W 136.21  904
Closure Error Distance> 0.0000
Total Distance Inversed> 1008.07
AREA: 74664.6 SQ METERS
```

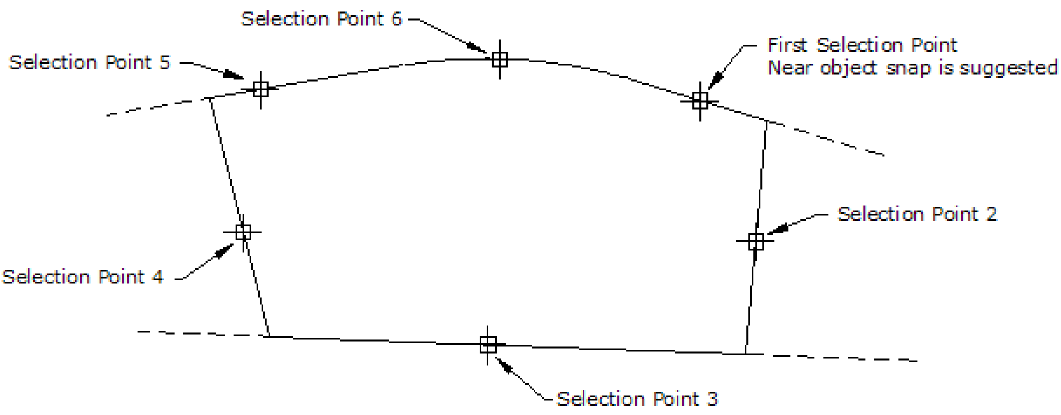
Pulldown Menu Location: Area/Layout
Keyboard Command: ia
Prerequisite: None

Area by Lines & Arcs

This command allows you to calculate the area of a perimeter or lot defined by lines, arcs, or polylines. Default settings for this command are set in *Area Defaults*. One of these settings is Max gap to join. If there is a gap greater than this value, the area is not reported, and the program will show where the gap is with a temporary X symbol. The area data shows up on the text screen. You can then choose to plot the area information to the drawing, or, by hitting *Enter,* just read it from the text screen.

Prompts

Select lines & arcs or polylines of perimeter for area calculation.
Select Objects: *select lines and arcs or polylines*
Lines and arcs are then joined together and the area calculated.
Pick area label centering point (Enter for none): *pick a point*
The area is then plotted at the point selected.



Pulldown Menu Location: Area/Layout
Keyboard Command: joinarea
Prerequisite: Lines, arcs, or polylines to define the area

Area by Interior Point

This command calculates and labels the area of the perimeter surrounding a picked interior point. The *Boundary Polyline* command is used to find the perimeter. Generally, this command will only work on closed or overlapping objects. Use *Area by Lines & Arcs* for other applications. The settings for the area label and for whether to prompt to create a closed polyline for the area are under the *Area Defaults* command.

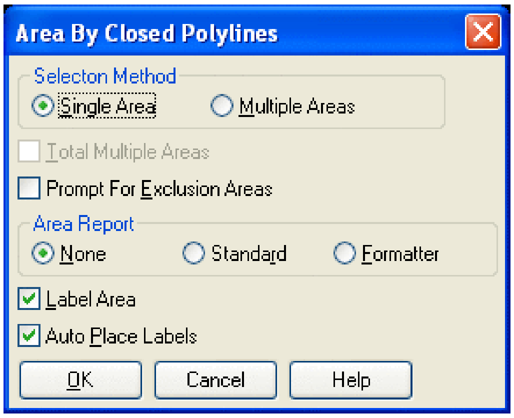
Prompts

Pick point inside area perimeter: *pick a point*
Pick area label centering point (Enter for none): *pick a point*
The area is then plotted at the point selected.

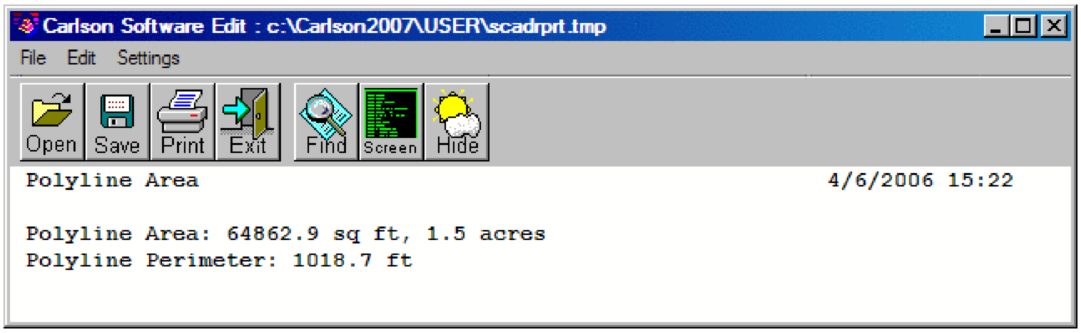
Pulldown Menu Location: Area/Layout
Keyboard Command: ptarea
Prerequisite: Set Area Defaults

Area by Closed Polylines

This command will calculate and report the area of single area and multiple area closed polylines. In the case of multiple areas, the user can choose to have the areas totaled (**Total Multiple Areas**) into a single result or to generate data for each area separately. Area by Closed Polyline will also automatically find special Carlson attributes attached to the polyline, in addition to capturing the area itself. These attributes will appear in the report, which can be the standard report or which can be presented in the Report Formatter, which itself links to Excel and Access. For example, property names and owner names, as applied to a polyline using the Mine modules, will report out automatically using Area by Closed Polyline. The command "Draw Lots from File..." will apply "extended entity data" to the lot polylines, which includes the lot name, and this will also report out when using Area by Closed Polyline. In addition, lot names, or any interior text whatsoever, can be captured and included in the report. The plot of the area on-screen can be canceled if only the report is desired.



Selecton Method
● Single Area ○ Multiple Areas
☐ Total Multiple Areas
☐ Prompt For Exclusion Areas
Area Report
● None ○ Standard ○ Formatter
☑ Label Area
☑ Auto Place Labels



```
Polyline Area                                           4/6/2006 15:22

Polyline Area: 64862.9 sq ft, 1.5 acres
Polyline Perimeter: 1018.7 ft
```

Prompts

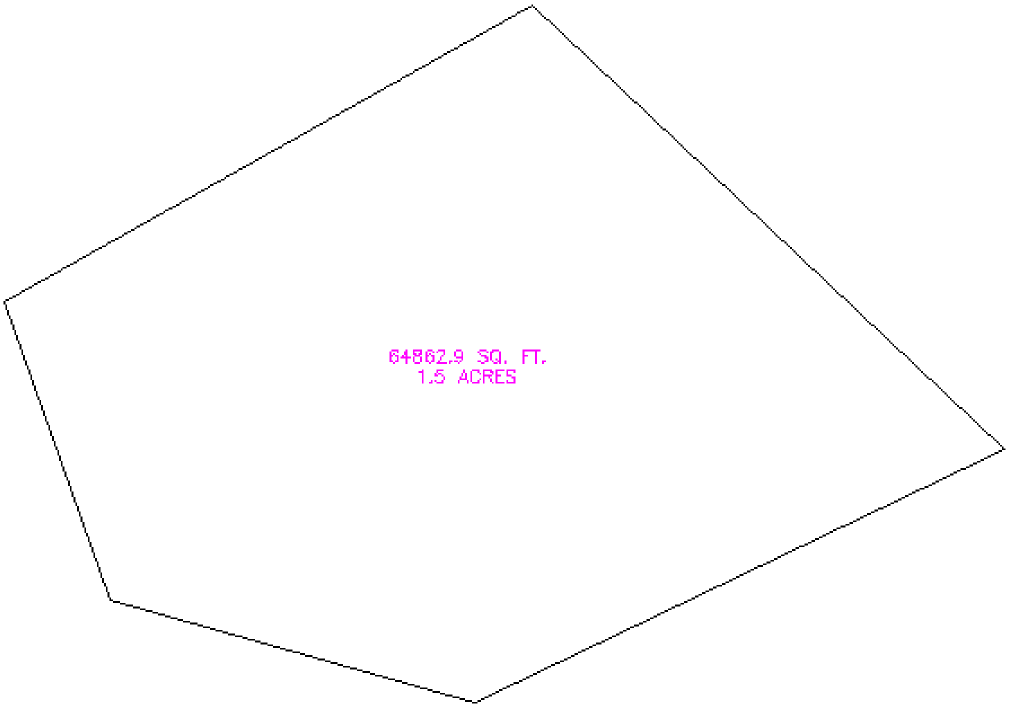
Select Area Polyline: *select the area polyline*
SQ. FEET: 64862.9 SQ. YARDS: 7207.0 SQ. MILES: 0.0
ACRES: 1.5 PERIMETER: 1018.7
Pick area label centering point (Enter for none): *pick a location*

When auto-placing labels at the rear of lots or when aligning labels by the sides of the lot the user will also be prompted to pick one or more centerlines (**Select the Centerline Polylines**). The routine will find the closest centerline and use this to determine the location of the front and back corners of the area.

When additional interior text is selected, the standard report will include that text:

Polyline Area 11/17/2004 12:49
Polyline Area: 43560.0 sq ft, 1.00 acres
Polyline Perimeter: 838.35 ft
Text: 16 Sf: 43560.0; Ac: 1.00

In this case, the "16" refers to Lot 16, and appears in the report because the lot number and existing area labeling were selected along with the polyline for the lot.



Pulldown Menu Location: Area/Layout
Keyboard Command: plarea
Prerequisite: Set Area Label Defaults

Tag Area Descriptions

This command is used to assign a description to a closed polyline. The description is stored with the polyline in the drawing. This description is used for reports in routines like Area By Closed Polylines.

Prompts

Select polyline for area description: *pick a polyline*
Area description <AREA1>: *West Pond*

Pulldown Menu Location: Area/Layout > Area Descriptions
Keyboard Command: tag_area_desc
Prerequisite: A closed polyline.

Identify Area Descriptions

This command reports area descriptions for the selected polylines. There are two methods. The Pick method reports the area description for one selected polyline at a time. The Search method scans the whole drawing and highlights polylines with area descriptions.

Prompts

Pick polylines to check or search drawing [<Pick>/Search]: *press Enter*
Select area description polyline: *pick a polyline*
Description: West Pond
Select area description polyline (Enter to end): *press Enter*

Pulldown Menu Location: Area/Layout > Area Descriptions
Keyboard Command: id_area_desc
Prerequisite: A polyline with a tagged area description.

Untag Area Descriptions

This command removes an area description that has been assigned to a polyline.

Prompts

Select polylines to remove area description from.
Select entities: *pick area polylines*
Cleared 10 area descriptions.

Pulldown Menu Location: Area/Layout > Area Descriptions
Keyboard Command: untag_area_desc
Prerequisite: A polyline with a tagged description.

Display Last Report

This brings up the last report generated by any Carlson Takeoff command that uses the standard report viewer.

Prerequisite: a previously generated report

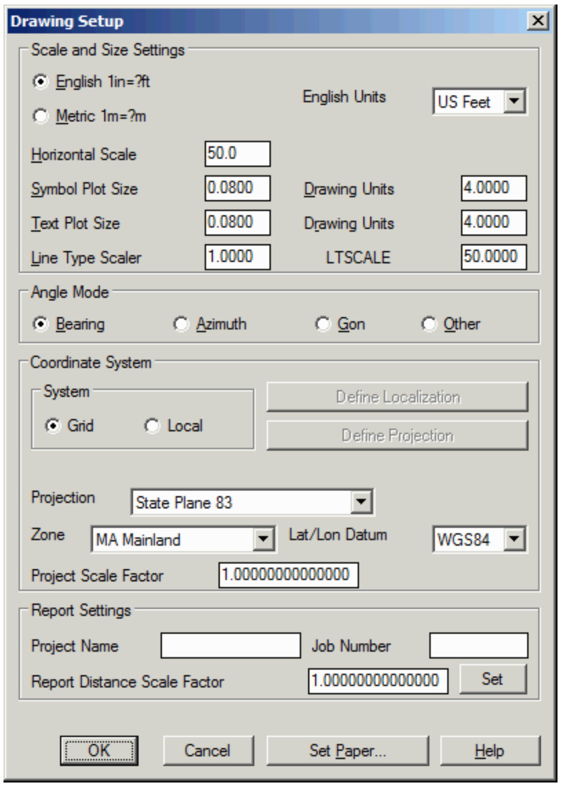
Keyboard Command: last_report

Settings Menu

16

Drawing Setup

This command allows you to specify drawing parameters, including the plotting scale, size of symbols, label annotation size, and the angle mode.



Drawing Setup

Scale and Size Settings

● English 1in=?ft

○ Metric 1m=?m

English Units: US Feet

Horizontal Scale: 50.0

Symbol Plot Size: 0.0800 — Drawing Units: 4.0000

Text Plot Size: 0.0800 — Drawing Units: 4.0000

Line Type Scaler: 1.0000 — LTSCALE: 50.0000

Angle Mode: ● Bearing ○ Azimuth ○ Gon ○ Other

Coordinate System

System: ● Grid ○ Local

Projection: State Plane 83

Zone: MA Mainland

Lat/Lon Datum: WGS84

Project Scale Factor: 1.00000000000000

Report Settings

Project Name:

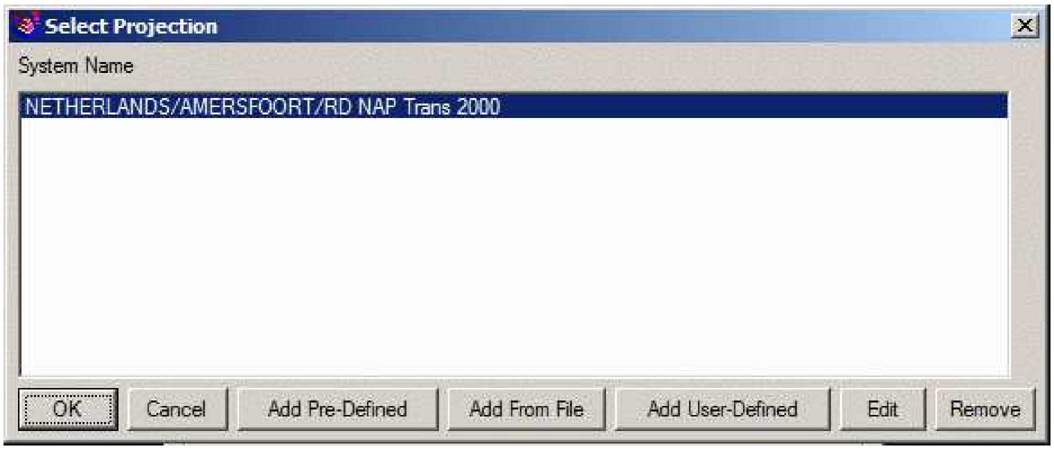
Job Number:

Report Distance Scale Factor: 1.00000000000000

- Specify **English 1in=?ft** or **Metric 1m=?m** as the unit mode to use. This affects the prompting and reports. When you are working on a drawing in English units, one unit equals one foot. In metric, one unit equals one meter.
- Specify the **Horizontal Scale** of the drawing. For example, if the horizontal scale is set to 50, then 1" = 50' is your drawing scale.
- The **Symbol Plot Size** value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The **Drawing Units** field shows the result of the Symbol Plot Size value (the scaler) multiplied by the horizontal scale.
- The **Text Plot Size** value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Text Plot Size is not entered in Drawing Units. The **Drawing Units** field shows the result of the Text Plot Size value (the scaler) multiplied by the horizontal scale.
- The **Line Type Scaler** option sets the linetype scale by multiplying this scaler by the horizontal scale.
- **Angle Mode-Bearing** sets reporting to bearing mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)
- **Angle Mode-Azimuth** sets reporting to north based azimuth mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)
- **Angle Mode-Gon** sets reporting to gon mode for any of the inquiry commands. (Modifies the settings in the AutoCAD *UNITS* command.)
- **Angle Mode-Other** lets the user determine angle mode by using the AutoCAD *UNITS* command.
- **Coordinate System** is an optional setting to define the drawing coordinate system. The coordinate system settings are used in commands like List Points and Label Lat/Lon to report geodetic coordinates from the drawing coordinates. The Grid System setting applies to drawing coordinates that are in a grid projection

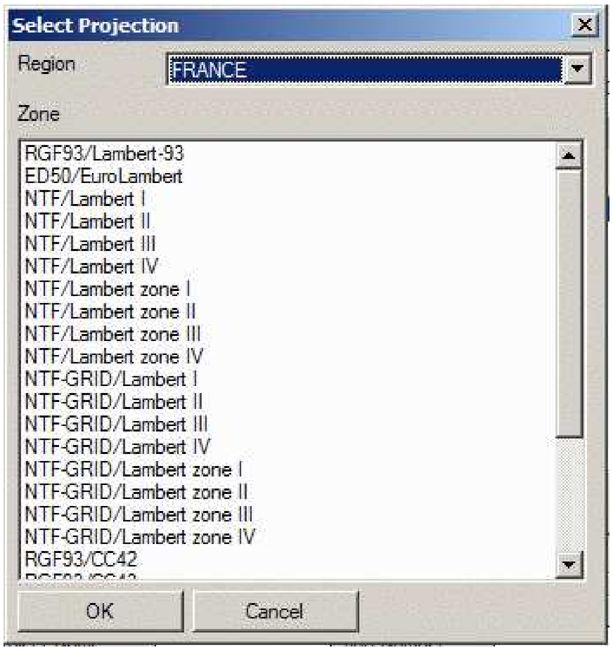
system such as state plane coordinates. The Projection list selects the grid projection from the list of supported projections. Along with the Projection, there are selections for the zone and datum to use with the projection. When the drawing setup is in English mode, there is a projection setting for whether the feet are in US Feet or International Feet units. The Local System setting applies to all other coordinate system beside grid projections. The Define Localization button has settings to define the transformation from local coordinates to grid coordinates. With a localization defined, you can work in a drawing in local coordinates and still report lat/lon. The localization definition contains pairs of local and grid coordinates that define the transformation. See the section on Localization under the Coordinate File Utilities command for more information. The Project Scale Factor is multiplied by the x,y coordinates when converting between drawing and geodetic coordinates.

- **Projection:** There are several built-in projection including State Plane 83, State Plane 27 and UTM. Also on the Projection list is an item for More Pre-Defined as well as User-Defined projections. This expanded Pre-Defined selection includes the projections used in SurvCE which has hundreds of projections including the US County projections for Minnesota and Wisconsin as well as from around the world. When you pick Pre-Defined, a dialog shows a list of recently selected Pre-Defined projections.



NETHERLANDS/AMERSFOORT/RD NAP Trans 2000

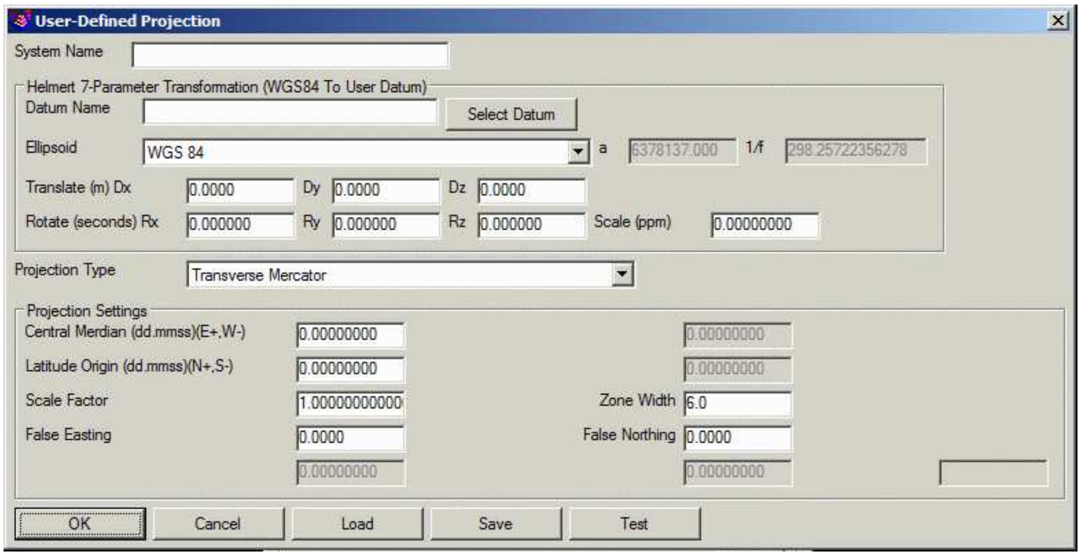
You can pick from this recently used list, or pick the Add Pre-Defined to select from the built-in list.



Region: FRANCE

RGF93/Lambert-93
ED50/EuroLambert
NTF/Lambert I
NTF/Lambert II
NTF/Lambert III
NTF/Lambert IV
NTF/Lambert zone I
NTF/Lambert zone II
NTF/Lambert zone III
NTF/Lambert zone IV
NTF-GRID/Lambert I
NTF-GRID/Lambert II
NTF-GRID/Lambert III
NTF-GRID/Lambert IV
NTF-GRID/Lambert zone I
NTF-GRID/Lambert zone II
NTF-GRID/Lambert zone III
NTF-GRID/Lambert zone IV
RGF93/CC42

The Add From File button reads in a projection saved to a file by this routine or by SurvCE CSL or ESRI PRJ. The Edit button allows you to change the name or parameters of a projection. The Remove function removes a projection from the list of recently used projections. The Add User-Defined routine defines a projection by setting the ellipsoid, choosing the method and entering the parameters. There are over 25 built-in ellipsoids to choose from such as Clarke 1880. You can also manually enter the ellipsoid values. The projection definition includes the 7 parameter Helmert transformation to go from WGS-84 to the user datum. There are over 20 projection types to choose from such as Transverse Mercator. After selecting the projection type, there are edit fields for each of the parameters for the selected projection. The Test button brings up a calculator to enter a lat/lon and report the projection coordinates as a way to test that the projection parameters are entered correctly and are working.



System Name

Datum Name

Ellipsoid WGS 84 a 6378137.000 1/f 298.25722356278

Translate (m) Dx 0.0000 Dy 0.0000 Dz 0.0000

Rotate (seconds) Rx 0.000000 Ry 0.000000 Rz 0.000000 Scale (ppm) 0.00000000

Projection Type Transverse Mercator

Central Merdian (dd.mmss)(E+,W-) 0.00000000 0.00000000

Latitude Origin (dd.mmss)(N+,S-) 0.00000000 0.00000000

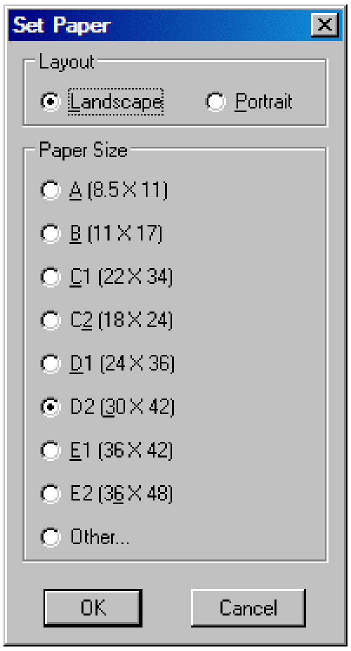
Scale Factor 1.00000000000 Zone Width 6.0

False Easting 0.0000 False Northing 0.0000

0.00000000 0.00000000

Besides Drawing Setup, these projection functions are also used in the Coordinate Transformation function in Coordinate File Utilities.

- **Project Name and Job Number** are optional fields that are used in the header for reports.
- **Report Distance Scale Factor** is used to show distances in a second system besides the drawing units. For example, this factor can be used to report distances in meters when the drawing is in feet, or it can be used to report grid distances when the drawings is in a ground coordinate system. This factor is applied in commands that have an option to label/report a second scaled distance such as the Inverse command and Annotate Defaults that applies to the angle/distance label routines. The scale factor can be entered directly into the edit box or calculated using the Set button which has feet-meters conversions as well as combined scale factor calculations for grid-ground factors. See the Scale Points command for more information on calculating the combined scale factor.
- The **Set Paper** button allows you to draw a rectangle on the screen that represents the edge of your paper. After you have set the horizontal scale, press the Set Paper button and the Set Paper dialog appears.



Set Paper

Layout

● Landscape ○ Portrait

Paper Size

○ A (8.5 X 11)

○ B (11 X 17)

○ C1 (22 X 34)

○ C2 (18 X 24)

○ D1 (24 X 36)

● D2 (30 X 42)

○ E1 (36 X 42)

○ E2 (36 X 48)

○ Other...

- The **Layout** option lets you specify landscape or portrait paper orientation. Landscape layout is where the width of the page is greater than the height of the page. Portrait layout is the opposite.
- The **Paper Size** option allows you to specify the paper size. The numbers in parenthesis represent drawing units and will be multiplied by the horizontal scale to determine the rectangle to be drawn. If you select the Other option, you will be prompted on the command line for the horizontal and vertical sizes of the paper.

Prompts (for Set Paper)

Pick or Type lower left corner point for border <(5000.00 5000.00 0.0)>: *pick a point*
Erase existing Set Paper boundary [<Yes>/No]? *Y* This prompt only appears if there is an existing paper boundary in this drawing.
Set Limits [Yes/<No>]? *Y* If you answer Yes to Set Limits, drawing limits are enabled, and AutoCAD restricts the coordinates you can enter to within the paper boundary. Drawing limits also determines the area of the drawing that can display grid dots, and the minimum area displayed by the Zoom All command on the View menu. To turn drawing limits off, type in LIMITS on the command line and set to Off.

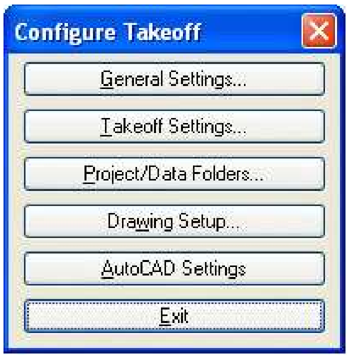
Drawing Setup also sets the AutoCAD dimension scale (DIMSCALE) and linetype scale (LTSCALE) to the Horizontal Scale.

Pulldown Menu Location: Settings
Keyboard Command: setup
Prerequisite: None

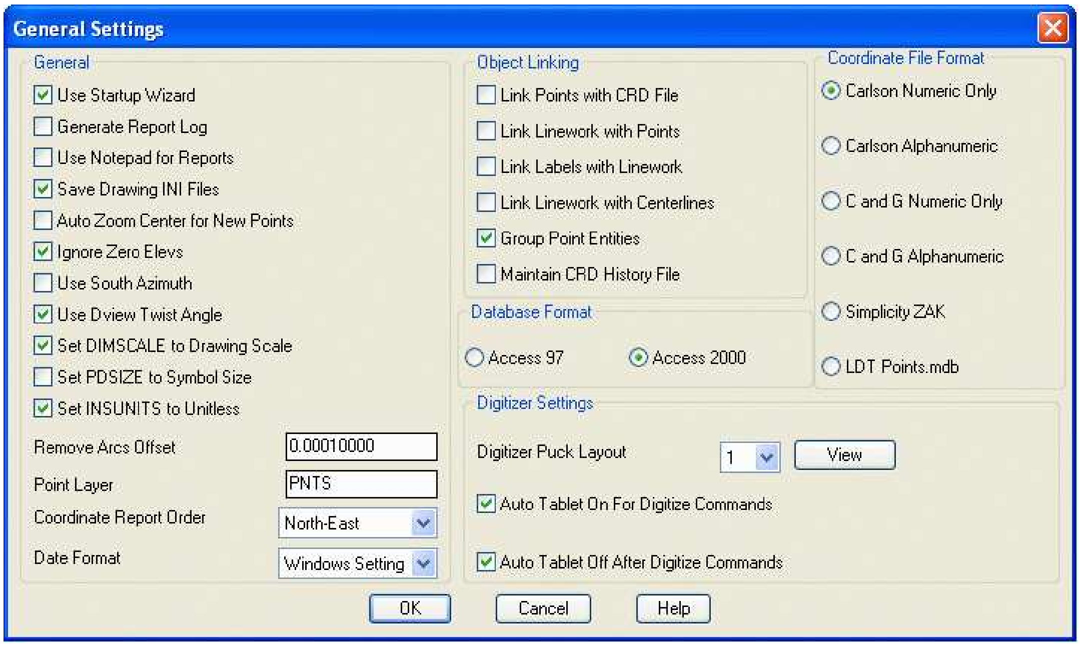
Configure

This command allows you to set the default settings that are used each time you start a new drawing or load an existing drawing. These settings are stored in ∗.ini files in the Carlson TakeOff directory. Configure restores the current drawing settings to these default settings.

1 In the Configure dialog box you choose between General Settings, Takeoff Module, Drawing Setup, and AutoCAD Settings.



2 In the General Settings dialog box you can set options for Carlson Takeoff.


General Settings

General
- ☑ Use Startup Wizard
- ☐ Generate Report Log
- ☐ Use Notepad for Reports
- ☑ Save Drawing INI Files
- ☐ Auto Zoom Center for New Points
- ☑ Ignore Zero Elevs
- ☐ Use South Azimuth
- ☑ Use Dview Twist Angle
- ☑ Set DIMSCALE to Drawing Scale
- ☐ Set PDSIZE to Symbol Size
- ☑ Set INSUNITS to Unitless

Remove Arcs Offset: 0.00010000
Point Layer: PNTS
Coordinate Report Order: North-East
Date Format: Windows Setting

Object Linking
- ☐ Link Points with CRD File
- ☐ Link Linework with Points
- ☐ Link Labels with Linework
- ☐ Link Linework with Centerlines
- ☑ Group Point Entities
- ☐ Maintain CRD History File

Database Format
○ Access 97 ● Access 2000

Coordinate File Format
- ● Carlson Numeric Only
- ○ Carlson Alphanumeric
- ○ C and G Numeric Only
- ○ C and G Alphanumeric
- ○ Simplicity ZAK
- ○ LDT Points.mdb

Digitizer Settings
Digitizer Puck Layout: 1
- ☑ Auto Tablet On For Digitize Commands
- ☑ Auto Tablet Off After Digitize Commands

A Under General, you can choose options relevant to points, angles, and start up.

- **Use Startup Wizard**: This option controls whether the wizard appears when you create a new drawing.

- **Generate Report Log**: This option allows output from several commands to be accumulated in a report buffer. Any report that is displayed in the standard report viewer is also added to the report log. While activated, the report log resides in the lower left corner of the desktop as a minimized title bar displaying the number of lines in the report buffer. To view the report log, pick the maximize icon on this title bar. You can edit the report log, save it to a file, or print it. To quickly turn the report log on and off, you can type REPORT at the command prompt, which toggles the report log on/off.

- **Use Notepad for Reports**: When this toggle is turned on, whenever a report is generated, it will appear in a Windows Notepad instead of the TakeOff Report Viewer.

- **Save Drawing INI Files**: This option creates an .ini file with the same name as the .dwg file to store the project data files for the drawing.

- **Put Data Files in DWG Directory**: This option sets the Data Path to the directory of the drawing. The Data Path is the default directory for data files such as the coordinate file (.crd).

- **Auto Zoom Center for New Points**: This option will zoom center on new points.

- **Ignore Zero Elevs**: This option causes entities with zero elevations to be excluded from calculations, etc.

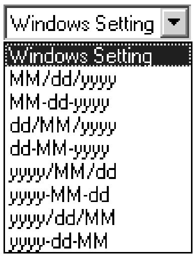
- **Use South Azimuth**: This option allows you to use a south azimuth for calculations.

- **Use Dview Twist Angle**: This option keeps text horizontal to a twist screen view.
- **Set Dimscale to Drawing Scale**: This option sets the AutoCAD Dimscale setting to equal the current drawing scale.
- **Set PDSIZE to Symbol Size**: When checked, the system variable PDSIZE will be set to the same size as the symbol size that you set in Drawing Setup. PDSIZE controls the display size of AutoCAD point entities. Normally AutoCAD point entities are displayed as a dot, and the size does not apply. You may modify the point display type by changing the system variable PDMODE. For example, if you set PDMODE to 64, point entities are displayed as a square regardless of the TakeOff symbol type used.

- **Remove Arcs Offset:** This makes arcs into straight lines if the arcs are smaller than the offset.

- **Point Layer**: You can assign a default layer name for points.

- **Date Format**: You can control the display of dates in Carlson TakeOff reports with this popdown menu. The default is 'Windows Setting' which allows you to control it with Windows Control Panel. Several other common formats are available.



- **Digitizer Puck Layout**: This option sets the layout for the digitizer puck keys. Pick the View button to see a graphic of the different layouts.

B Under Support Paths, you must determine paths for file allocation and retrieval.

- **MS Excel Path**: You determine the path for the ∗.exe file for MS Excel is located.
- **Coordinate Report Order**: You can choose whether coordinates are reported in northing-easting or easting-northing order.

C Under Object Linking, you can set reactors to the drawing entities.

- **Link Points with CRD File**: This option attaches a reactor to the point entities so that any change to the entities such as MOVE or ROTATE will update the coordinates in the coordinate file.
- **Link Linework with Points**: This option attaches reactors to line and polyline entities that are drawn by point number so that moving the points automatically moves the linework.
- **Link Labels with Linework**: This option applies to bearing/distance annotation. This link updates the annotation when the linework is modified.
- **Group Point Entities**: This option joins the three entities of a point (attribute block, symbol, node). For each point, selecting any one of these entities selects all three entities for the point.

D Under CRD File Pt# Format, you can set the point number format for coordinate files.

- **Carlson Numeric Only**: This is the default format upon installation. Point numbers cannot contain letters and must be in the range from 1 to 32767.
- **Carlson Alphanumeric**: This native Carlson format allows letters in the point numbers, and the point name can be up to 10 characters. Any combination of letters and numbers is acceptable.

- **C&G Numeric**: This format of the C&G division supports up to 5 digits, with a 65000 point limit.

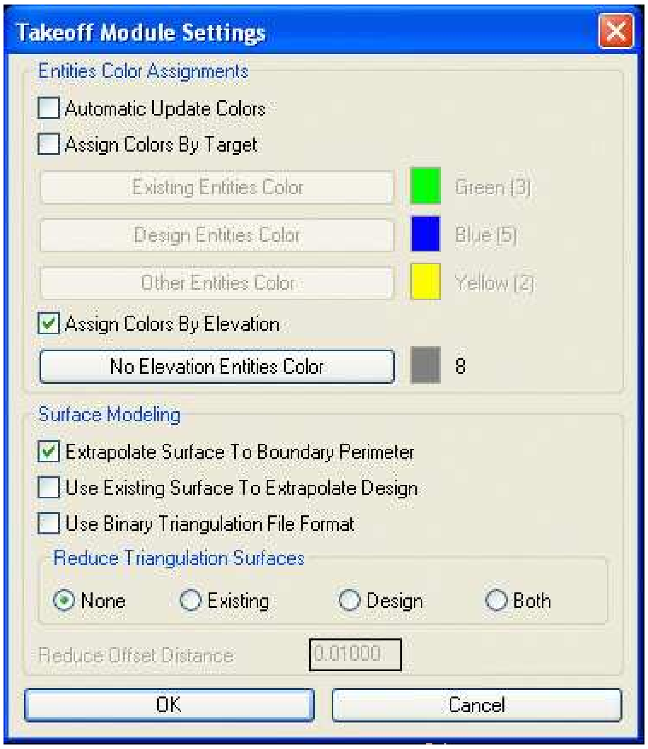
- **C&G Alphanumeric**: This format of the C&G division supports up to 10 characters, with no limit to the number of points.

- **Simplicity ZAK**: This format is the one used by Simplicity Systems programs. The file uses a Microsoft Access database format.

- **LDD Points.mdb**: This is a Microsoft Access database used by Autodesk Land Desktop. The file is typically named "points.mdb" and is found in a projects \Cogo directory. The number limitation is established by the database structure, but is frequently numeric and allows unlimited point numbers.

E Under Database Format you choose between Microsoft Access 97 or 2000 format. This only applies to new .MDB files created by Takeoff.

3 Takeoff Settings



Takeoff Module Settings

Entities Color Assignments

☐ Automatic Update Colors

☐ Assign Colors By Target

Existing Entities Color 🟩 Green (3)

Design Entities Color 🟦 Blue (5)

Other Entities Color 🟨 Yellow (2)

☑ Assign Colors By Elevation

No Elevation Entities Color ■ 8

Surface Modeling

☑ Extrapolate Surface To Boundary Perimeter

☐ Use Existing Surface To Extrapolate Design

☐ Use Binary Triangulation File Format

Reduce Triangulation Surfaces

● None ○ Existing ○ Design ○ Both

Reduce Offset Distance 0.01000

- **Automatic Update Colors:** This refreshes colors in your drawing as they change: i.e. elevating entities, setting layers for different Targets, etc. If your drawing is very large and is slow to automatically refresh you may want to toggle this off and use the **Update Colors For Set Elevations** command under View when you want/need to see the color changes.

- **Assign Colors By Target**: This option allows you to set the Existing, Design, and Other layers to any color you define.

- **Assign Colors By Elevation**: This option allows you to set the color for entities needing elevations.

- **Extrapolate Surface To Boundary Perimeter**: When this is check ON surfaces are extended and volumes are calculated out to your boundary perimeter. When this is checked OFF surfaces and calculations end at the extents of your design data.

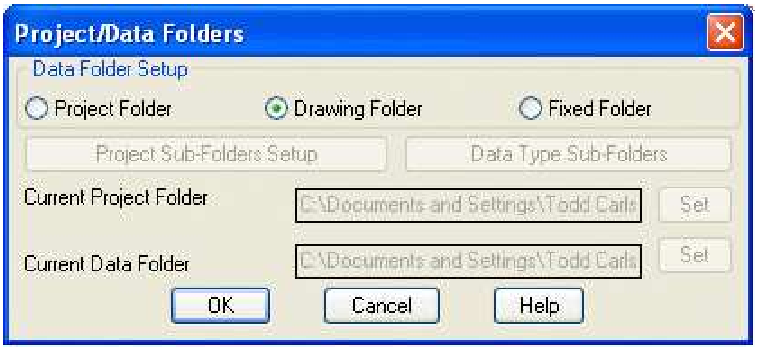
- **Use Existing Surface To Extrapolate Design**: When this is checked ON surfaces and volumes are calculated to the extents of your existing data.

- **Use Binary Triangulation File Format**: This option sets the format for the surface model files as either binary or ASCII. The binary format has a .tin file name extension and loads about twice as fast and has about 50% less file size than ASCII. The ASCII format has a .flt extension and is the legacy format used by other Carlson products and Softdesk.

- **Reduce Triangulation Surfaces**: This causes edges within the selected surface Tin mesh to be collapsed to reduce the number of triangles, edges, and points within the mesh while having a minimal impact on the overall shape of the mesh.

Reduction Offset Distance: This setting is used by the Reduce Triangulation Surfaces command to set the reduction tolerance. Specify the maximum average distance that any point can be moved outside of the plane of any triangle that connects to that point. Values might range from .01 to .1 for most purposes.

4 This dialog box allows you to set up your. **Data Path**. You determine can where data files (∗.crd, ∗.tin, etc.) are stored. Either in defined folders (Project Folder), the same place where your drawing (.dwg) is stored, which is the default and recommended (Drawing Folder), or in the same folder no matter which drawing you are working on (Fixed Folder).


Project/Data Folders

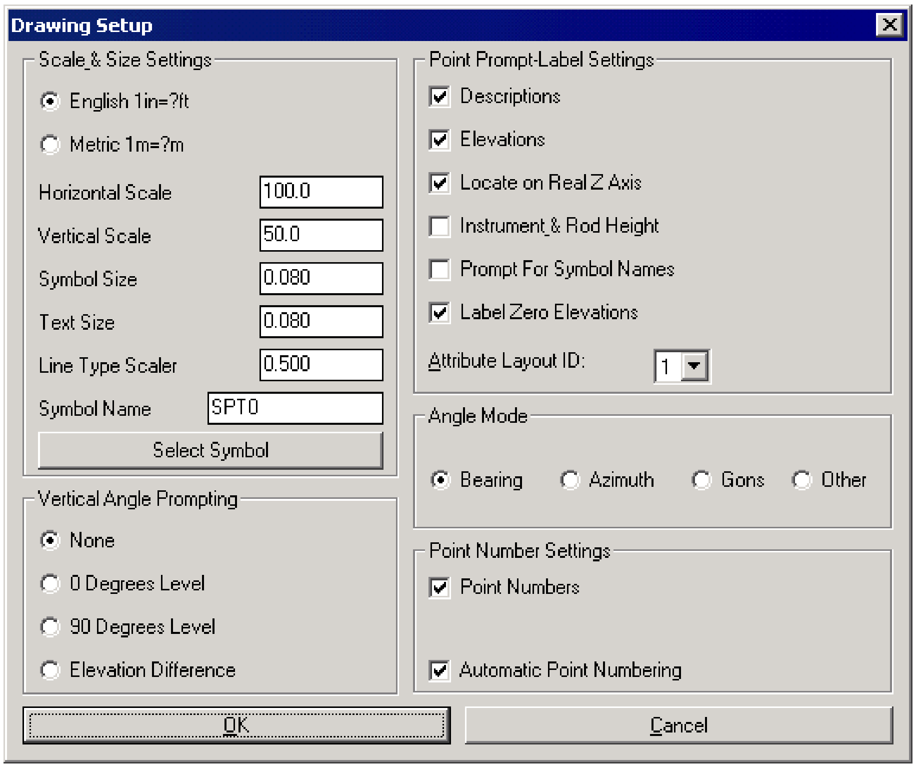
Data Folder Setup

○ Project Folder ● Drawing Folder ○ Fixed Folder

Current Project Folder: C:\Documents and Settings\Todd Carls

Current Data Folder: C:\Documents and Settings\Todd Carls

5 In the Drawing Setup dialog box you have options for setting drawing parameters, including the plotting scale, size of symbols, label annotation size, and the drawing mode.


Drawing Setup

Scale & Size Settings

● English 1in=?ft

○ Metric 1m=?m

Horizontal Scale: 100.0

Vertical Scale: 50.0

Symbol Size: 0.080

Text Size: 0.080

Line Type Scaler: 0.500

Symbol Name: SPT0

Vertical Angle Prompting

● None

○ 0 Degrees Level

○ 90 Degrees Level

○ Elevation Difference

Point Prompt-Label Settings

☑ Descriptions

☑ Elevations

☑ Locate on Real Z Axis

☐ Instrument & Rod Height

☐ Prompt For Symbol Names

☑ Label Zero Elevations

Attribute Layout ID: 1

Angle Mode

● Bearing ○ Azimuth ○ Gons ○ Other

Point Number Settings

☑ Point Numbers

☑ Automatic Point Numbering

A Under Scale and Size Settings, you can determine scale and size of drawing entities.

- **English 1in=?ft**: This option tells the program which unit mode to use. This affects the prompting and reports. When you are working on a drawing in English units, one unit equals one foot.

- **Metric 1m=?m**: This option sets the metric scale to meters only.

- **Horizontal Scale**: This option allows you to set the horizontal scale of the drawing. For example, if the horizontal scale is set to 50, then 1" = 50' in your drawing.

- **Vertical Scale**: This option allows you to set the vertical scale of the drawing.

- **Symbol Size**: . This value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Symbol Plot Size is not entered in Drawing Units

- **Text Size**: This value is a scaler that represents the size on the plot. The Drawing Units are determined by multiplying the scaler by the horizontal scale. In English mode the scaler represents the plotted size in inches. In Metric mode, this value is the plotted size in centimeters. The Text Plot Size is not entered in Drawing Units.

- **Line Type Scaler**: This option sets the linetype scale by multiplying this scaler by the horizontal scale.

- **Symbol Name**: This option allows you to set the default symbol name for points.

- **Select Symbol**: Click this button to graphically select the default symbol.

B Under Point Prompt-Label Settings, select the options that determine how the points are to be labeled and how you will be prompted for point entry.

- **Descriptions**: Determines whether you are prompted for a point description when creating points and whether the point descriptions are labeled in the point block.

- **Elevations**: Sets prompting and labeling for point elevations.

- **Locate on Real Z Axis**: Switches between locating points at zero elevation and at the actual stored elevations.

- **Instrument & Rod Height**: Turns on prompting for instrument and rod heights when creating points.

- **Prompt for Symbol Name**: When checked, the program will prompt for a symbol name as each point is drawn. Otherwise, the default symbol name set in this dialog box will be used.

- **Attribute Layout ID**: Controls the location of the point number, elevation, and description. These attribute layouts are defined in drawings that are stored in the TakeOff Support directory with the file name of SRVPNO plus the ID number (i.e. SRVPNO1.DWG, SRVPNO2.DWG, etc.). If you want to change the attribute positions for a layout ID, then edit the associated SRVPNO drawing.

C Under Angle Mode, you determine how angles are entered and displayed.

- **Bearing**: This option sets reporting to bearing mode for any of the Inquiry commands.

- **Azimuth**: This option sets reporting to north based azimuth mode for any of the Inquiry commands.

- **Gon**: This option sets reporting to gon mode for any of the Inquiry commands.

- **Other**: Allows you to set a custom angle mode by using the Units Control command (described later in this chapter).

D Under Vertical Angle Mode select an option to determine how the vertical angle is calculated. Vertical Angle Prompt applies to creating points with commands such as Traverse.

- **None**: The vertical angle will not be used to calculate point elevations.

- **0 Degrees Level**: The vertical angle is used to calculate elevation and horizontal distance.

- **90 Degrees Level**: The zenith angle is used to calculate elevation and horizontal distance.

- **Elevation Difference**: Use the elevation difference to calculate the elevation.

E Under Point Number Settings, select the options that determine whether you will be prompted for point numbers by the commands that locate points.

- **Point Numbers**: When this toggle is checked on, points that are inserted by TakeOff commands are shown with a point number, and a coordinate is stored in the current coordinate (.crd) file. When this toggle is off, points are shown with no point number plotted and no coordinate is stored in the current coordinate (.CRD) file.
- **Automatic Point Numbering**: If this toggle is checked on, commands that locate a point will automatically insert a point number for each point drawn on the screen. If Automatic Point Numbering toggle is off, commands that locate a point will prompt for a point number.

5 AutoCAD Settings: This command allows the user to set up a number of options, pertaining to the directory file system, color combinations for the display screen, text fonts, workspace utitlities like shortcut keys etc. **Keyboard Command**: _preferences

Prerequisites: None

Keyboard Command: CONFIG_SCAD

Edit Symbol Library

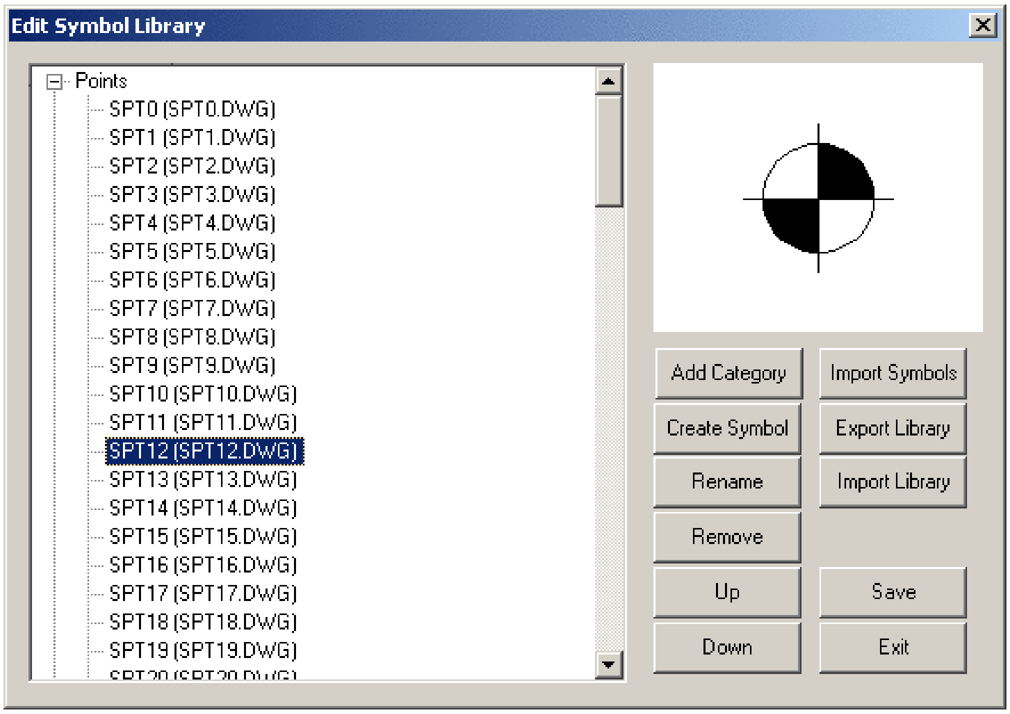
This command allows you to customize the symbol library. For a printout of the default symbols, get the symbols.pdf in the Carlson Projects folder.

Categories are a way for grouping symbols by type for your own convenience in symbol selection. A new category is added by clicking on the "Add Category" button. An edit field then appears in the tree view on the left and waits for you to enter the category name. The input is finished by pressing the Enter key.

The category may be populated by creating a new symbol from selected entities in the drawing, by specifying drawing (.DWG) files, or by moving existing symbols from one category to another.

To create a new symbol, open a drawing which has the entities to be used in the symbol. The symbol should be drawn at unit size (scale 1:1) because Carlson will scale the symbol by the current drawing scale when the symbol is used. Highlight the category for the symbol and click on the "Create Symbol" button. A dialog appears for entering the new symbol name. Next, specify the file name for the symbol. The file name has a .DWG extension and would usually reside in the Carlson SUP directory, but you may use another path. Then the program will prompt you to select the entities from the drawing for the symbol. An insertion point for the symbol must also be picked.

The "Import Symbols" button brings up a file selection dialog which allows you to select multiple files to be added to the current category (to select multiple files use Shift or Control keys along with the mouse). If the files you select are not in the Carlson SUP directory, the program will offer an option of copying them there. There are also Import Library and Export Library buttons.


Edit Symbol Library
Points
SPT0 (SPT0.DWG)
SPT1 (SPT1.DWG)
SPT2 (SPT2.DWG)
SPT3 (SPT3.DWG)
SPT4 (SPT4.DWG)
SPT5 (SPT5.DWG)
SPT6 (SPT6.DWG)
SPT7 (SPT7.DWG)
SPT8 (SPT8.DWG)
SPT9 (SPT9.DWG)
SPT10 (SPT10.DWG)
SPT11 (SPT11.DWG)
SPT12 (SPT12.DWG)
SPT13 (SPT13.DWG)
SPT14 (SPT14.DWG)
SPT15 (SPT15.DWG)
SPT16 (SPT16.DWG)
SPT17 (SPT17.DWG)
SPT18 (SPT18.DWG)
SPT19 (SPT19.DWG)
Add Category
Import Symbols
Create Symbol
Export Library
Rename
Import Library
Remove
Up
Save
Down
Exit

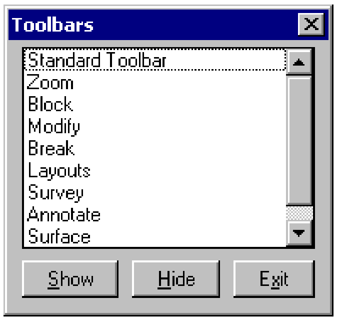
By default, the symbol description is the same as file name. The description for the symbol or category name may be changed by highlighting that name and clicking on "Rename" button, the name being edited is then placed into edit mode. To move a symbol into a different category, select the symbol to be moved on the tree and click an "Up" or "Down" button as many times a needed to reach the desired category. The symbols are sorted alphabetically within each category, while categories are remaining in the order placed to allow the more frequently accessed categories be on top.

Note: The symbol library is stored in an ASCII file named symbols.dta in the Carlson \USER directory.

Pulldown Menu Location: Settings
Keyboard Command: editptsym
Prerequisite: None

Toolbars

This command allows you to display and hide toolbars. Click on a toolbar name and press the Show or Hide button.


Toolbars
Standard Toolbar
Zoom
Block
Modify
Break
Layouts
Survey
Annotate
Surface
Show
Hide
Exit

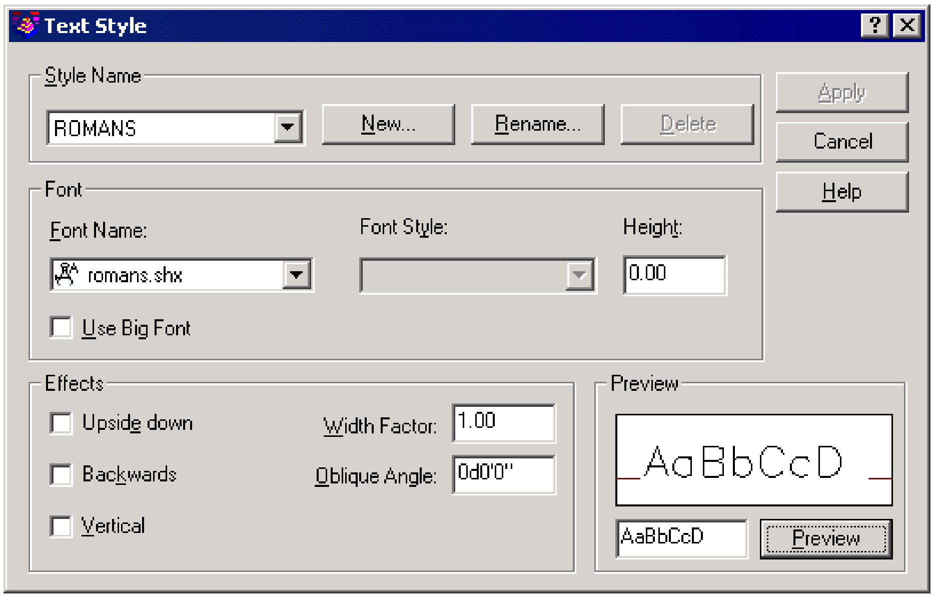
- **Show**: Turns on the selected toolbar. If the toolbar is already visible, then this does nothing.
- **Hide**: Turns off the selected toolbar. If the toolbars is already hidden, then this does nothing. If the toolbar is floating, you can also turn it off by clicking the x in the upper right corner.
- **Exit**: Exits this command

Prerequisite: None

Keyboard Command: TBARCFG

Text Style

This command creates or modifies named styles and sets the current style for text in your drawing



Style Name: ROMANS

Font Name: romans.shx

Height: 0.00

Width Factor: 1.00

Oblique Angle: 0d0'0"

Preview text: AaBbCcD

1 Under Style Name, you can display text style names, add new styles, and rename and delete existing styles. The list contains defined style names and displays the current style by default. To change the current style, select another style from the list, or choose New to create a new style.

- **New**: This option displays the New Text Style dialog box and automatically supplies the name "stylen" (where n is the number of the supplied style) for the current settings. You can accept the default or enter a name and choose OK to apply the current style settings to the new style name.

- **Rename**: This option displays the Rename Text Style dialog box. The text style listed is renamed when you enter a new name and choose OK.

- **Delete**: This option deletes a text style. Select a name from the list to make it current, and then choose Delete.

2 Under Font you can change the style's font.

- **Font Name**: This field lists the font family name for all registered TrueType fonts and all compiled shape (SHX) fonts in the TakeOff Fonts directory. When you select a name from the list, the program reads the file for the specified font. The file's character definitions are loaded automatically unless the file is already in use by another text style. You can define several styles that use the same font.

- **Font Style**: This field specifies font character formatting, such as italic, bold, or regular. When Use Big Font is selected, this option changes to Big Font Name and is used to select a Big Font file name.

- **Height**: This field sets the text height based on the value you enter. If you enter 0.0, the program prompts for the text height each time you enter text using this style. Entering a height greater than 0.0 sets the text height for this style. TrueType fonts can be displayed at a smaller height than SHX fonts with the same height setting. The text height you specify may not be accurately represented by uppercase letters in TrueType fonts supplied with TakeOff.

- **Use Big Font**: This option specifies an Asian-language Big Font file. Use Big Font is available only if you specify an SHX file under Font Name. Only SHX files are valid file types for creating Big Fonts.

3 Under Effects, you modify characteristics of the font, such as its height, width factor, and obliquing angle and whether it is displayed upside down, backwards, or vertically aligned. TrueType fonts using the effects described in

this section might appear bold on the screen. Onscreen appearance has no effect on plotted output. Fonts are plotted as specified by applied character formatting.

- **Upside Down**: This option displays the characters upside down.
- **Backwards**: This option displays the characters backwards.
- **Vertical**: This option displays the characters aligned vertically. Vertical is available only if the selected font supports dual orientation. Vertical orientation is not available for TrueType fonts.
- **Width Factor**: This option sets the character spacing. Entering a value less than 1.0 condenses the text. Entering a value greater than 1.0 expands it.
- **Oblique Angle**: This option sets the obliquing angle of the text. Entering a value between -85 and 85 makes the text oblique.

4 Under Preview, you can display sample text that changes dynamically as you change fonts and modify the effects. To change the sample text, enter characters in the box below the character preview image.

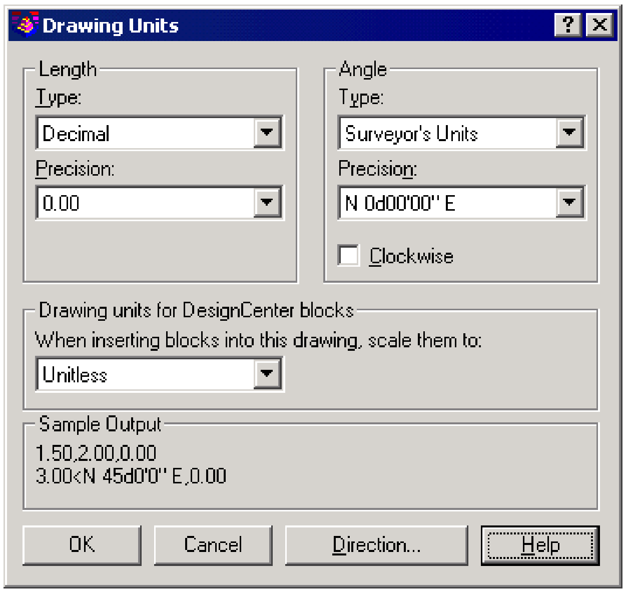
- **Preview**: This field updates the sample text in the character preview image according to any changes you've made in the dialog box. Height has no effect in the character preview image because a very large text height might show little or no text.

Prerequisite: None

Keyboard Command: STYLE

Units Control

The Drawing Units dialog box controls coordinate and angle display formats and determines precision.



Length
Type: Decimal
Precision: 0.00

Angle
Type: Surveyor's Units
Precision: N 0d00'00" E
☐ Clockwise

Drawing units for DesignCenter blocks
When inserting blocks into this drawing, scale them to: Unitless

Sample Output
1.50,2.00,0.00
3.00<N 45d0'0" E,0.00

1 Under Length, you specify the current unit of measurement and the precision for the current units.

- **Type**: This field sets the current format for units of measure. The values include Architectural, Decimal, Engineering, Fractional, and Scientific. The Engineering and Architectural formats produce feet-and-inches displays and assume that each drawing unit represents one inch. The other formats can represent any real-world unit.
- **Precision**: This field sets the number of decimal places for the current units display.

2 Under Angle you specify the current angle format and the precision for the current angle display.

- **Type**: This field sets the current angle format.
- **Precision**: This field sets the precision for the current angle display.

TakeOff uses the following conventions for the various angle measures: decimal degrees appear as decimal numbers, grads appear with a lowercase g suffix, and radians appear with a lowercase r suffix. The degrees/minutes/seconds format uses d for degrees, ' for minutes, and " for seconds, for example:

123d45'56.7"

Surveyor's units show angles as bearings, using N or S for north or south, degrees/minutes/seconds for how far east or west the angle is from direct north or south, and E or W for east or west, for example:

N 45d0'0" E

The angle is always less than 90 degrees and is displayed in the degrees/minutes/seconds format. If the angle is precisely north, south, east, or west, only the single letter representing the compass point is displayed.

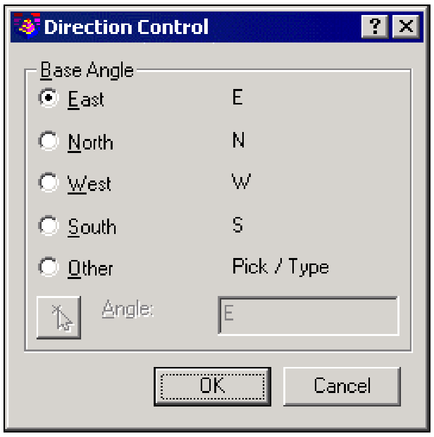
- **Clockwise**: This option calculates positive angles in the clockwise direction. The default direction for positive angles is counterclockwise.

When the program prompts for an angle, you can point in the desired direction or enter an angle regardless of the setting specified for Clockwise.

3 Under Drawing Units for TakeOff DesignCenter blocks, you can control the unit of measurement used for block insertions. A block created in units that differ from the units specified in this option is scaled and inserted in the specified units. Select Unitless to insert the block as is and not scale the block to match the specified units. Source content units and Target drawing units settings in the User Preferences tab of the Options dialog box under the Settings menu are used when Insert Units are not defined.

4 Sample Output displays an example of the current settings for units and angles.

Direction displays the Direction Control dialog box described below.



Direction Control

Base Angle

● East E

○ North N

○ West W

○ South S

○ Other Pick / Type

Angle: E

A The Base Angle determines where 0 degrees is located when the program calculates angles. The base angle sets the direction of the base angle. These options affect the entry of angles, object rotation angles, the display format, and the entry of polar, cylindrical, and spherical coordinates. Choose East, North, West, or South, or choose Other to indicate an alternative direction. The default direction for the zero angle is East. In TakeOff, the base angle is relative to the orientation of the user coordinate system.

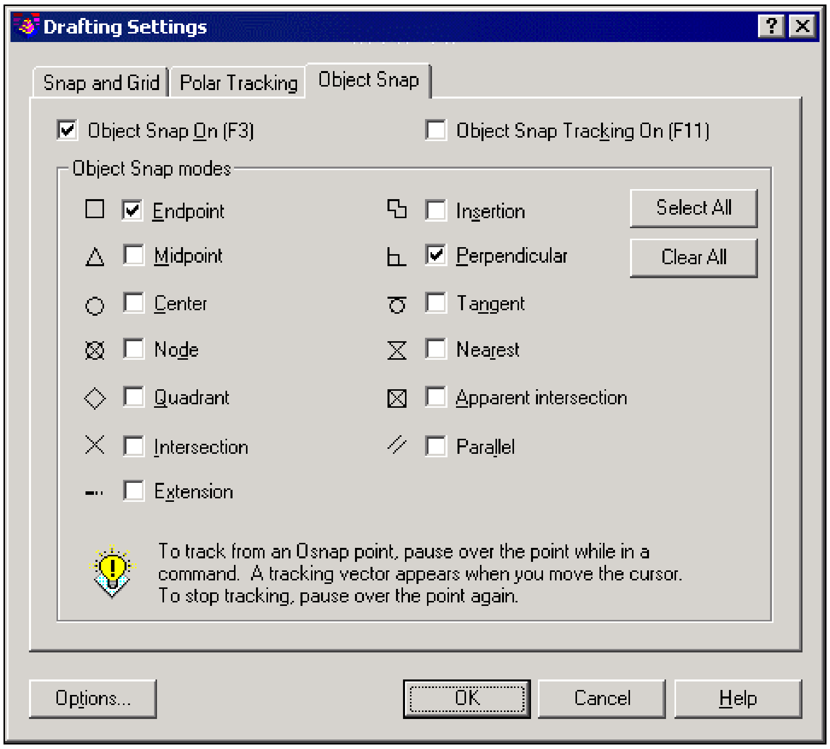
- **East**: Sets the base angle to east (default is zero degrees).
- **North**: Sets the base angle to 90 degrees north.
- **West**: Sets the base angle to 180 degrees west.
- **South**: Sets the base angle to 270 degrees south.
- **Other**: Sets a direction different from the points of the compass.
- **Angle**: Sets the angle. Available only when Other is selected.
- **Pick an Angle**: Uses the pointing device to define the angle based on the angle of an imaginary line connecting any two points you specify. Available only when Other is selected.

Prerequisite: None

Keyboard Command: UNITS

Object Snap

The Drafting Settings dialog box sets object snap modes.



☑ Object Snap On (F3)
☐ Object Snap Tracking On (F11)

Object Snap modes

☑ Endpoint
☐ Midpoint
☐ Center
☐ Node
☐ Quadrant
☐ Intersection
☐ Extension
☐ Insertion
☑ Perpendicular
☐ Tangent
☐ Nearest
☐ Apparent intersection
☐ Parallel

To track from an Osnap point, pause over the point while in a command. A tracking vector appears when you move the cursor. To stop tracking, pause over the point again.

1 Under Object Snap, you set object snaps.

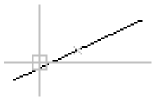
- **Object Snap On**: This option turns running object snaps on and off. The object snaps selected under Object Snap Modes are active while object snap is on. This setting is also controlled by the OSMODE system variable.

- **Object Snap Tracking On**: This option turns object snap tracking on and off. With object snap tracking the cursor can track along alignment paths based on other object snap points when specifying points in a command. To use object snap tracking, you must turn on one or more object snaps.

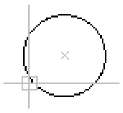
2 Under Object Snap Modes, you turn on running object snaps.

- **Endpoint**: Snaps to the closest endpoint of an arc, elliptical arc, line, multiline, polyline segment, spline, region, or ray or to the closest corner of a trace, solid, or 3D face.

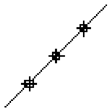
- **Midpoint**: Snaps to the midpoint of an arc, ellipse, elliptical arc, line, multiline, polyline segment, solid, spline, or xline.



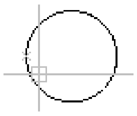
- **Center**: Snaps to the center of an arc, circle, ellipse, or elliptical arc.



- **Node**: Snaps to a point object.

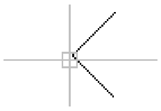


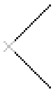
- **Quadrant**: Snaps to a quadrant point of an arc, circle, ellipse, or elliptical arc.



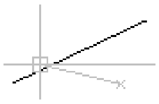
- **Intersection**: Snaps to the intersection of an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline. Intersection snaps to the edges of regions and curves, but does not snap to the edges or corners of 3D solids.

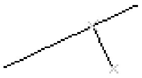
Extended Intersection snaps to the imaginary intersection of two objects that would intersect if the objects were extended along their natural paths. Carlson TakeOff automatically turns on Extended Intersection when you select the Intersection object snap mode. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on at the same time. Intersection and Extended Intersection work with edges of regions and curves, but not with edges or corners of 3D solids.



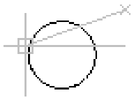


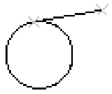
- **Extension**: Causes a temporary extension line to display when you pass the cursor over the endpoint of objects, so you can draw objects to and from points on the extension line.
- **Insertion**: Snaps to the insertion point of an attribute, a block, a shape, or text.
- **Perpendicular**: Snaps to a point perpendicular to an arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, solid, spline, or xline. Carlson TakeOff automatically turns on Deferred Perpendicular snap mode when the object you are drawing requires you to complete more than one perpendicular snap. You can use a line, arc, circle, polyline, ray, xline, multiline, or 3D solid edge as an object from which to draw a perpendicular line. You can use Deferred Perpendicular to draw perpendicular lines between such objects. When the aperture box passes over a Deferred Perpendicular snap point, the program displays a Snaptip and marker.





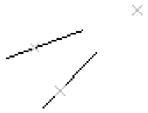
- **Tangent**: Snaps to the tangent of an arc, circle, ellipse, or elliptical arc. Carlson TakeOff automatically turns on Deferred Tangent snap mode when the object you are drawing requires you to complete more than one tangent snap. For example, you can use Deferred Tangent to draw a line that is tangent to two arcs, polyline arcs, or circles. When the aperture box passes over a Deferred Tangent snap point, the program displays a marker and Snaptip. If you use the From option in conjunction with the Tangent snap mode to draw objects other than lines from arcs or circles, the first point drawn is tangent to the arc or circle in relation to the last point selected in the drawing area.





- **Nearest**: Snaps to the nearest point on an arc, circle, ellipse, elliptical arc, line, multiline, point, polyline, spline, or xline.
- **Apparent Intersection**: Apparent Intersection includes two separate snap modes: Apparent Intersection and Extended Apparent Intersection. You can also locate Intersection and Extended Intersection snap points while running Apparent Intersection object snap mode is on. Apparent Intersection snaps to the apparent intersection of two objects (arc, circle, ellipse, elliptical arc, line, multiline, polyline, ray, spline, or xline) that do not intersect in 3D space but may appear to intersect in the drawing display. Extended Apparent Intersection snaps to the imaginary intersection of two objects that would appear to intersect if the objects were extended along their natural paths. You might get varying results if you have both the Intersection and Apparent Intersection running object snaps turned on

at the same time. Apparent and Extended Apparent Intersection work with edges of regions and curves but not with edges or corners of 3D solids.



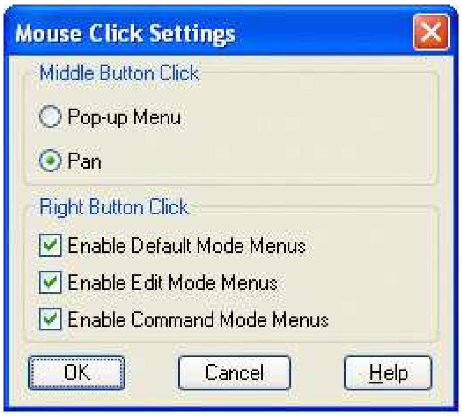
- **Parallel**: Draws a vector parallel to another object whenever Carlson TakeOff prompts you for the second point of a vector. After specifying the first point of a vector, if you move the cursor over a straight line segment of another object, the program acquires the point. When the path of the object you create is parallel to the line segment, the program displays an alignment path, which you can use to create the parallel object.
- **Clear All**: This option turns off all object snap modes.
- **Select All**: This option turns on all object snap modes.

Prerequisite: None

Keyboard Command: OSNAP

Mouse Click Settings

This command can be used to make custom mouse click preferences. The Middle Button Click applies to a 3-button mouse and chooses between using the middle button for real-time pan or to show an Object Snap pop-up menu. For the right mouse button, there are different levels of pop-up menus that can be activated. With all these menus off, the right button will be used like the Enter keyboard.



Mouse Click Settings

Middle Button Click

○ Pop-up Menu

● Pan

Right Button Click

☑ Enable Default Mode Menus

☑ Enable Edit Mode Menus

☑ Enable Command Mode Menus

Keyboard Command: CLICKSET
Prerequisite: none

Set/Reset X-Hairs

Set X-Hairs sets the crosshairs either to align with the selected line or polyline or to a user-specified slope. *Reset X-Hairs* restores the crosshairs alignment to horizontal.

Pulldown Menu Location: Settings > Crosshairs
Keyboard Commands: setxhairs, resetxhairs
Prerequisite: Line entity

Set UCS to World

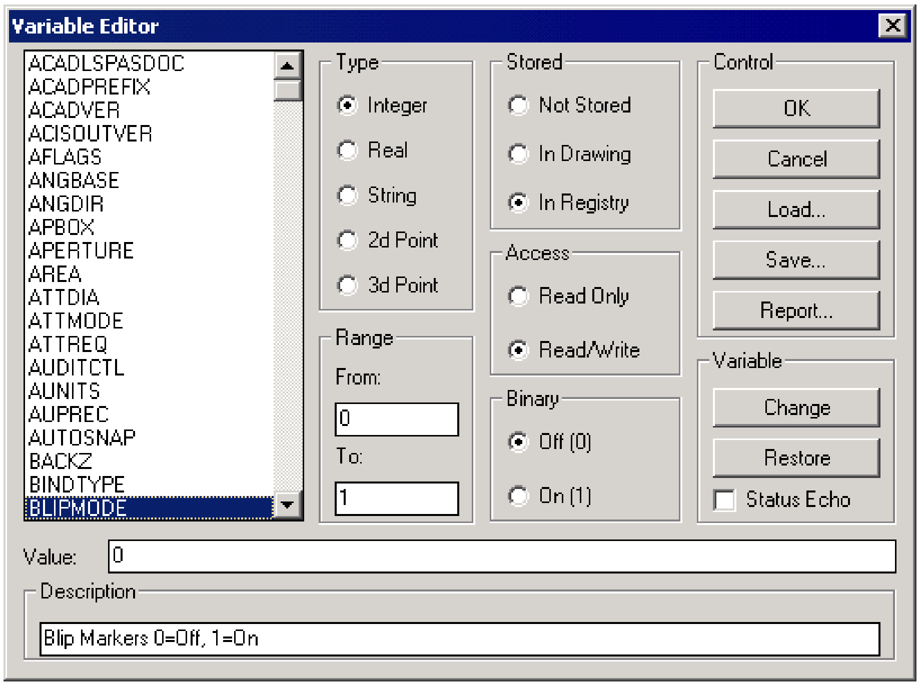
This command sets the UCS (user coordinate system) to the world coordinate system (WCS). Carlson TakeOff works exclusively in the world coordinate system and there is no way to change this setting. In AutoCAD, it is possible to change the coordinate system from WCS. If you receive a drawing in which the coordinate system is not set to world, use this command to restore the UCS.

Prerequisite: None

Keyboard Command: UCS_WORLD

Set Environment Variables

The AutoCAD engine stores the values for its operating environment and some of its commands in system variables. Each system variable has an associated type: integer, real, point, switch, or text string. This command allows you to list or change the values of system variables.



Type: ● Integer ○ Real ○ String ○ 2d Point ○ 3d Point

Stored: ○ Not Stored ○ In Drawing ● In Registry

Access: ○ Read Only ● Read/Write

Binary: ● Off (0) ○ On (1)

Range From: 0 To: 1

☐ Status Echo

Value: 0

Description: Blip Markers 0=Off, 1=On

1 Dialog Fields

- **List Box**: Contains a list of the variables associated with the currently running version of AutoCAD. There are more items than will display on the list box, use the scroll bar to move up and down through the list. Picking on an item in the list box makes it the current item, causing the information about the item to be displayed, and can be affected by most of the edit commands explained below.

- **Edit Field**: When an item on the list box is picked, its current setting is displayed in the edit field. If you intend to make changes in an item, use standard editing procedures including the use of arrow keys and/or pointer movements to make changes. Once changes have been made, you must use the CHANGE options explained below to effect changes. Pressing enter at the edit field will have no effect on the item in the list. If the item selected is a read-only variable, the edit field will be grayed-out and will not allow input.

- **Description**: When an item on the list box is picked, its definition is referenced and displayed in this field. This can be a benefit in learning the uses of the assorted system variables. This is a display only field, so you can't change the description given.

2 Under Type Group, the type of variable will be displayed indicated by one of the radio buttons. Each of these types are explained below for your benefit. For additional information on variable types used by AutoCAD, obtain and consult a source of AutoCAD documentation.

- **Integer**: Defined as a whole number in the range from -32767 to +32768, no decimal value accepted.
- **Real**: Defined as a real number in the range from -1.797E+308 to +1.797E+308, with extreme decimal accuracy maintained.. Some real variables have a smaller range than previously stated.
- **String**: Defined as a sequential array of characters in the range from 0 to 65535 characters, with a range of ASCII (0-255). Numbers can be included in strings, even though they have no mathematical significance.
- **2D Point**: Defined as a list of two real numbers in the range from -1.797E+308 to +1.797E+308 separated by a comma, having extreme decimal accuracy maintained. Always maintain the X,Y format, one (and only one) comma must be used, separating the X and Y.
- **3D Point**: Defined as a list of three real numbers in the range from -1.797E+308 to +1.797E+308 separated by commas. While editing a 3D point, you must always maintain the X,Y,Z format, two (no less or no more), commas must used, separating the X and Y and Z values.

3 Under Range Group, the variable displayed will usually have a range displayed. The FROM value indicating the minimum, and the TO value being the maximum value accepted.

4 Under the Store Group, depending on the type of variable, AutoCAD may store the value in the drawing or the configuration file, or it may not be stored. Each of these types are explained below for your benefit.

- **Not Stored**: Some variables, such as PLATFORM and CDATE, are not stored because they are system interdependent.
- **In Drawing**: Most variables are stored in the drawing, making the drawing format more personal than just a database of objects. This allows you to open a drawing and have it behave just as though you had never left it.
- **In Config**: These are variables that remain the same regardless of the drawing opened. APERTURE and PICKBOX are just two examples of variables stored in the configuration file.

5 Under Access Group, depending on the type of variable, AutoCAD may not allow you to make changes to it. Each of these types are explained below.

- **Read Only**: Some variables, such as PLATFORM and CDATE, are read-only and therefore cannot be changed. Read-Only variables are marked and the edit field will be grayed indicating that you can't change the variable.
- **Read/Write**: Most variables are read/write and can be changed. These variables are marked and the edit field will be active so you can change the variable.

6 Under Binary Group, depending on the type of variable, the value may be off or on, yes or no. If the variable type is not binary, this group will be grayed out entirely.

- **Off (0)**: Indicate an off condition. Some variables, such as ATTREQ, are simply on or off toggles. You may change a binary item by clicking in this group to change the variable, or changing the value in the edit field.
- **On (1)**: Indicate an on condition. Binary variables are simply on or off toggles. Their range is from 0 to 1. You may change a binary item by clicking to change the variable, or changing the value in the edit field.

7 Control Buttons - These buttons are the main controls in the use of the Variable Editor. Each buttons purpose is explained below.

- **OK**: Used to accept the changes made during the variable editing process, returning you to the command prompt with changes in effect.
- **Cancel**: Used to cancel the changes made during the variable editing process, returning you to the command prompt without the changes in effect.
- **Load**: Used to load a saved set of system variables. This allows you to create a drawing, save the system variables, open a second drawing, and load those variables into that drawing. Read-only variables are skipped.
- **Save**: Used to save the current system variables to a disk file. All system variables are stored to the file, even those that are marked as read-only.

- **Print**: Used to print the current system variables. After choosing this option, you will prompted for an output filename, then the program will proceed to write the system variables to the file. This file can be loaded into any editor or word processor, edited and printed.

8 Variable Buttons - These buttons are used to control the changes in variables, while using the Variable Editor. Each buttons purpose is explained below.

- **Change**: Used to execute the changes typed into the edit field. You must use this button, simply pressing enter will not make the change.
- **Restore**: Used to cancel the changes typed into the edit field. If you make a mistake or change your mind while making changes in the edit field, press this button to restore the edit field to the value before editing.
- **Status**: Used to determine if the program will echo the status of changes being made to the command area. If this toggle is on, any changes made from the dialog will echo the change. Also if a stream of change commands is being read from a file, and the toggle is on, the changes taking place will be displayed.

Note: This command displays many more system variables than are found in Chapter 18, which contains a list of **supported** system variables. Modification of any system variable other than the supported ones found in Chapter 18 is done at your own risk, and may result in program errors requiring a re-installation of Carlson TakeOff.

Prerequisite: None

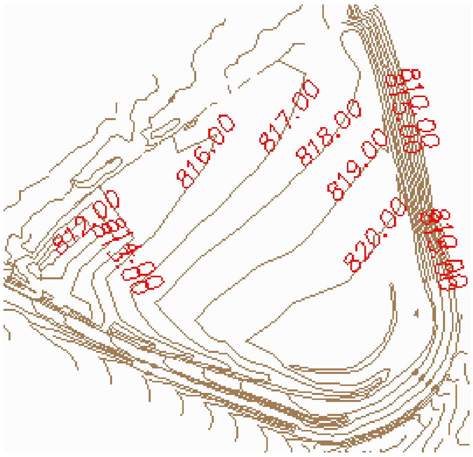
Keyboard Command: VAREDIT

Display Menu

17

Existing Drawing

This command allows you to display all the entities on the layers that are grouped as part of the Existing Drawing.

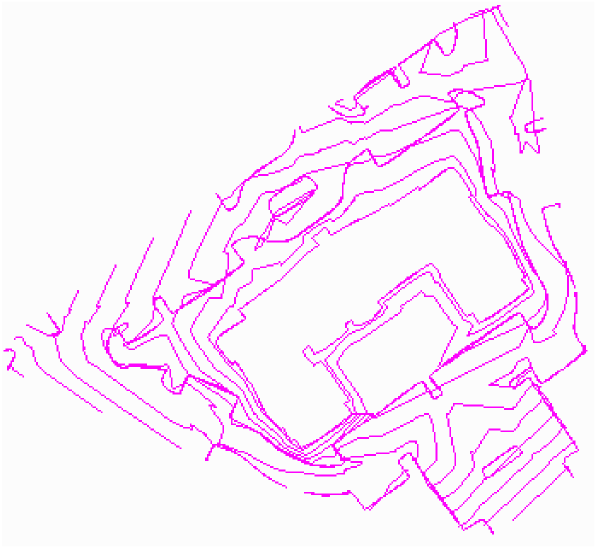


Carlson TakeOff allows you to assign layers into three different "Target" surface groups: Existing, Design, and Other. For more about assigning layers to different "Target" surface groups see Define Layer Target/Material/Subgrade under the tools menu. Once layers have been assigned, the display menu allows for easy viewing of each "Target" surface. When Existing Drawing is checked than the existing drawing will be displayed. If it is not checked it will not be displayed. You can check on and off the other "Target" surfaces to view the existing drawing in isolation or in accordance to the other drawings.

Keyboard Command: set_display_exist_dwg
Prerequisite: Define Layer Target/Material/Subgrade

Existing Contours

This command displays all the contours that represent the existing surface (For contouring options see Display Options). Clicking on Cut/Fill Labels from the menu runs the command and puts a check mark on the menu. Picking again turns it off.

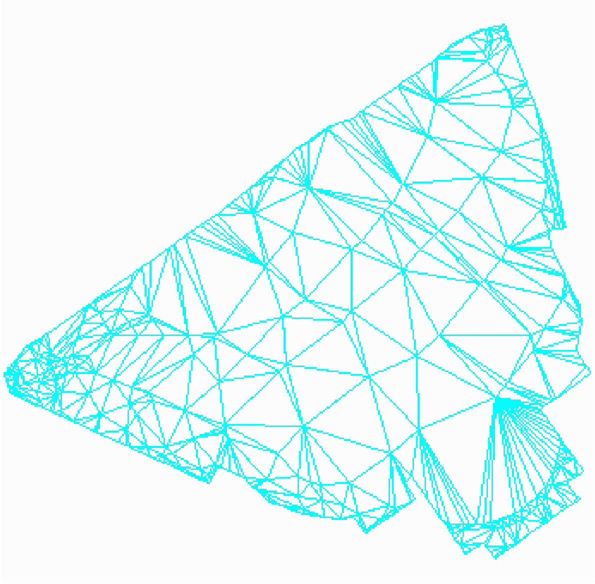


When Existing Contours is checked than all the contours for the existing surface will be displayed. If it is not checked they will not be displayed.

Prerequisite: existing surface
Keyboard Command: set_display_exist_ctr

Existing Surface

This command allows you to display the surface triangulation for the existing drawing.

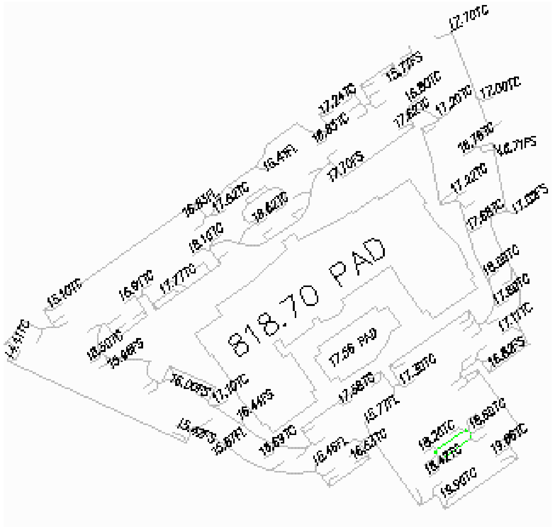


When Existing Surface is checked than all the triangulation for the existing will be displayed. If it is not checked, they will not be displayed.

Keyboard Command: set_display_exist_grd
Prerequisite: an existing surface

Design Drawing

This command allows you to display all the entitles on the layers that are grouped as part of the Design Drawing.

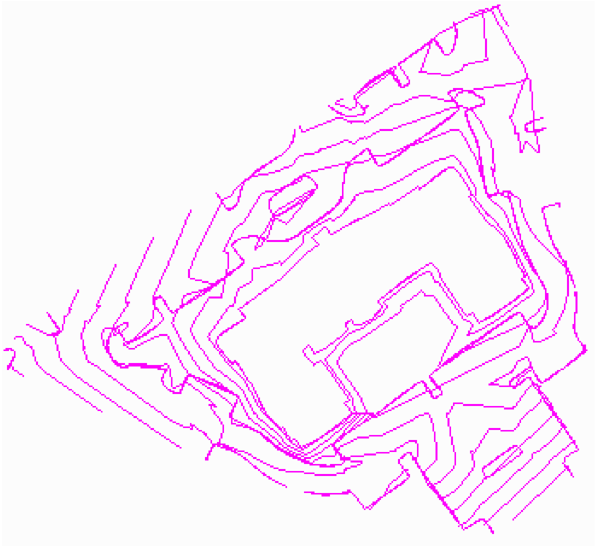

12.70TC
15.77FS
17.24TC
17.20TC
17.00TC
16.49FL
17.70FS
17.22TC
17.77TC
15.10TC
16.91TC
818.70 PAD
17.56 PAD
17.38TC
16.44FS
18.69TC
16.46FL
16.63TC
19.96TC
19.90TC

Carlson TakeOff allows you to assign layers into three different "Target" surface groups: Existing, Design, and Other. For more about assigning layers to different "Target" surface groups see Define Layer Target/Material/Subgrade under the tools menu. Once layers have been assigned, the display menu allows for easy viewing of each "Target" surface. When Design Drawing is checked than the design drawing will be displayed. If it is not checked it will not be displayed. You can check on and off the other "Target" surfaces to view the Design drawing in isolation or in accordance to the other drawings.

Keyboard Command: set_display_final_dwg
Prerequisite: Define Layer Target/Material/Subgrade

Design Contours

This command displays all the contours that represents the design surface (For contouring options see Display Options). Clicking on Cut/Fill Labels from the menu runs the command and puts a check mark on the menu. Picking again turns it off.



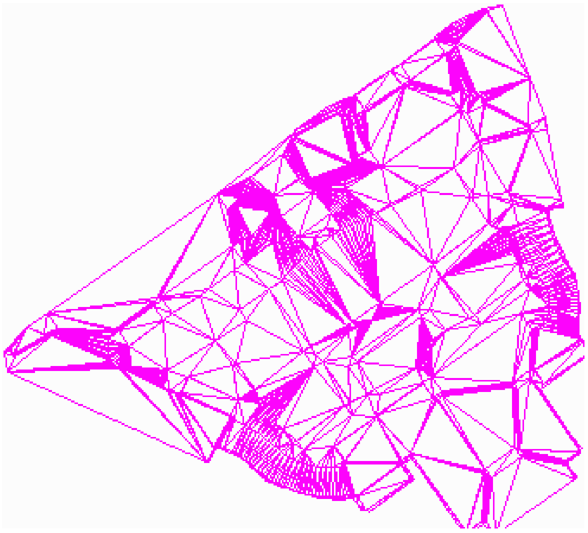
When Design Contours is checked than all the contours for the design will be displayed. If it is not checked they will not be displayed.

Keyboard Command: set_display_final_ctr

Prerequisite:design surface

Design Surface

This command allows you to display the surface triangulation for the design drawing.

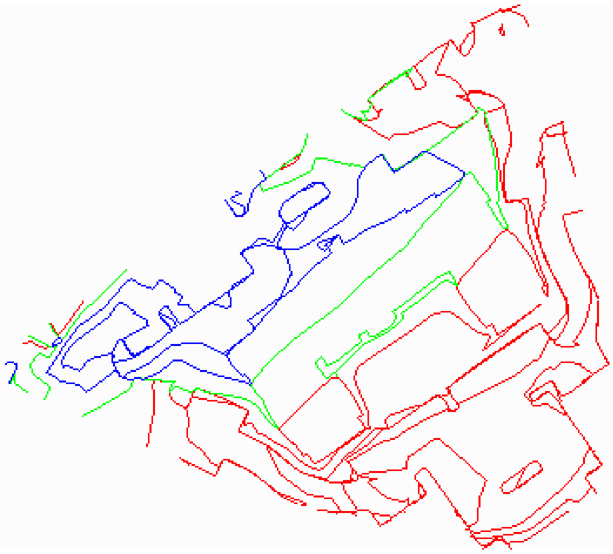


When Design Surface is checked than all the triangulation for the design will be displayed. If it is not checked, they will not be displayed.

Keyboard Command: set_display_final_grd
Prerequisite: a design surface

Cut/Fill Contours

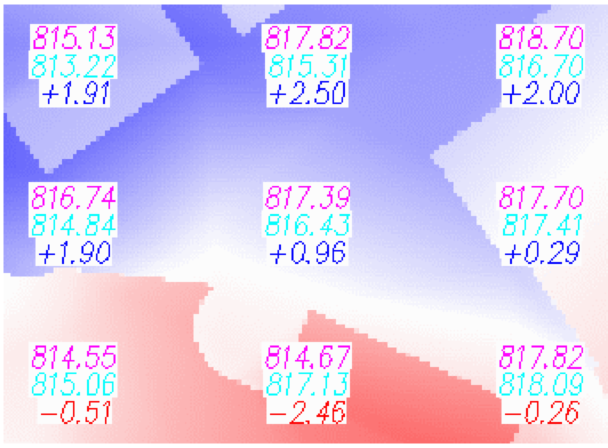
This command compares the existing and design surfaces and shows the cut/fill contours in blue for fill and red for cut. There is a Draw Only Cut/Fill Daylight option and Draw Labels option as part of the Display Options command (See Display Options for more information). Clicking on Cut/Fill Contours from the menu runs the command and puts a check mark on the menu. Picking again turns it off.

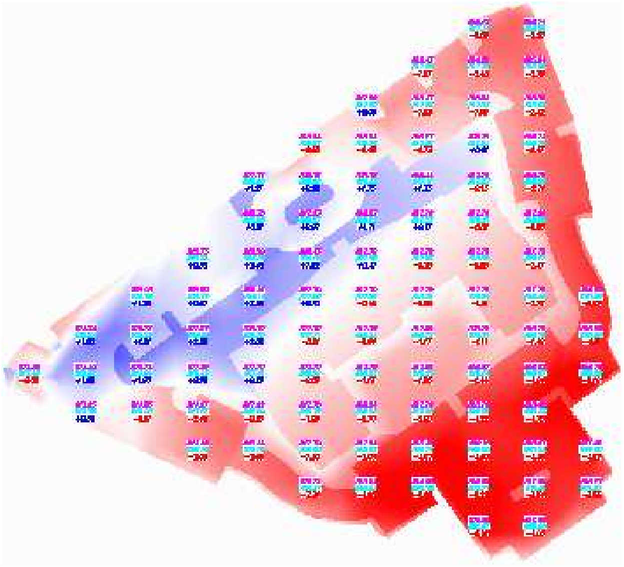


Keyboard Command: set_display_cf_ctr
Prerequisite: elevation differences between existing and design

Cut/Fill Labels

This command displays the design elevation, the existing elevation, and the amount to either cut or fill right on the screen (See Display Options for information about labeling options). Picking on Cut/Fill Labels from the menu runs the command and puts a check mark on the menu. Picking again turns it off.

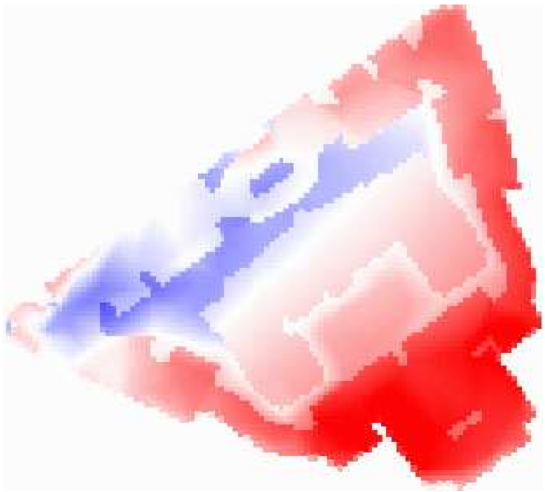

815.13
813.22
+1.91
817.82
815.31
+2.50
818.70
816.70
+2.00
816.74
814.84
+1.90
817.39
816.43
+0.96
817.70
817.41
+0.29
814.55
815.06
−0.51
814.67
817.13
−2.46
817.82
818.09
−0.26



Keyboard Command: set_display_cf_txt
Prerequisite: existing and design surfaces

Cut/Fill Color Map

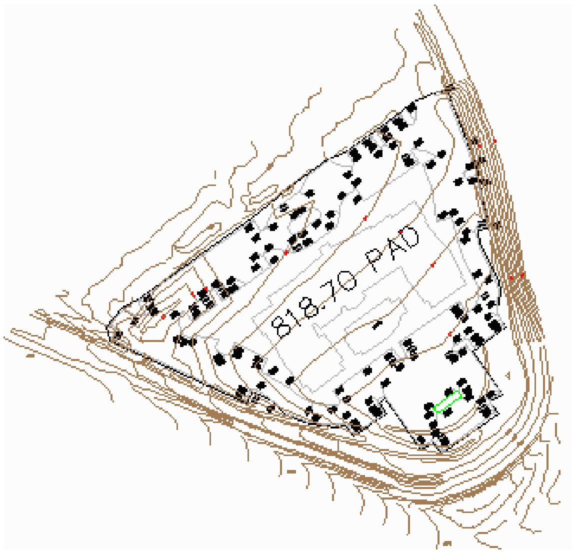
This command compares the existing and design surfaces and shows the cut/fill regions in blue for fill and red for cut (See Display Options for information on pixel resolution). Clicking on Cut/Fill Color Map from the menu runs the command and puts a check mark on the menu. Picking again turns it off.



Keyboard Command: set_display_cf_map
Prerequisite: existing and design surfaces

Other Drawing

This command allows you to display all the entities on the layers that are grouped as part of the Other drawing.

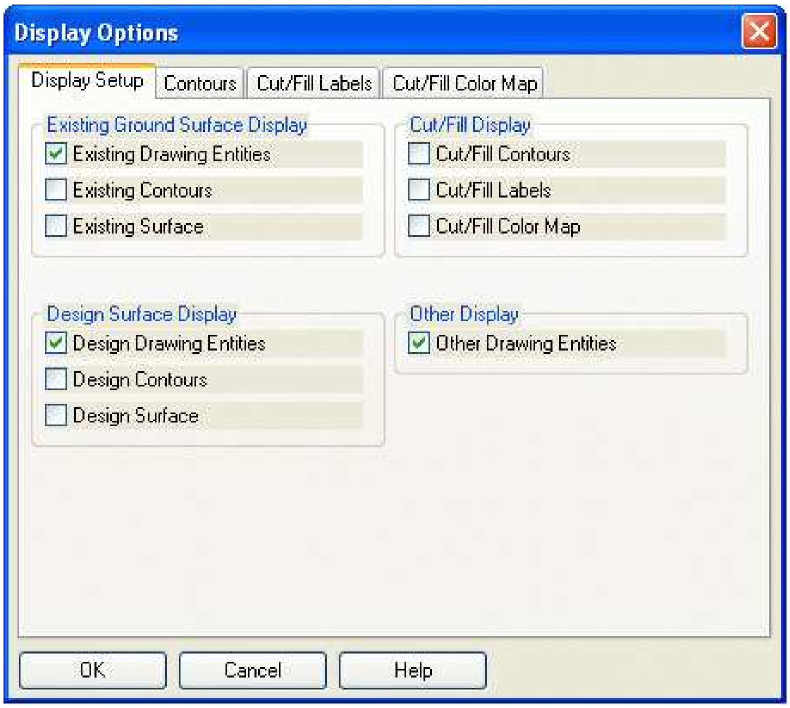


Carlson TakeOff allows you to assign layers into three different "Target" surface groups: Existing, Design, and Other. For more about assigning layers to different "Target" surface groups see Define Layer Target/Material/Subgrade under the tools menu. Once layers have been assigned, the display menu allows for easy viewing of each "Target" surface. Typically, most layers are listed under Other before they are assigned to Existing or Design. Some layers, like perimeter, are neither apart of the Existing or the Design drawing so they remain under Other. When Other Drawing is checked than the entities grouped under Other will be displayed. If it is not checked it will not be displayed. You can check on and off the other "Target" surfaces to view the Other surface in isolation or in accordance to the other surfaces. In this example, Existing, Design, and Other are all shown.

Keyboard Command: set_display_other_dwg
Prerequisite: Define Layer Target/Material/Subgrade

Display Options

This command allows you to change the features of the different display commands. Note: You can toggle on/off the Existing, Design, and Other surfaces by right clicking with your mouse. To activate this feature type in "shortcutmenu" in the command line and then <1>. To turn off the feature type in <0>.


Display Options
Display Setup
Contours
Cut/Fill Labels
Cut/Fill Color Map
OK
Cancel
Help

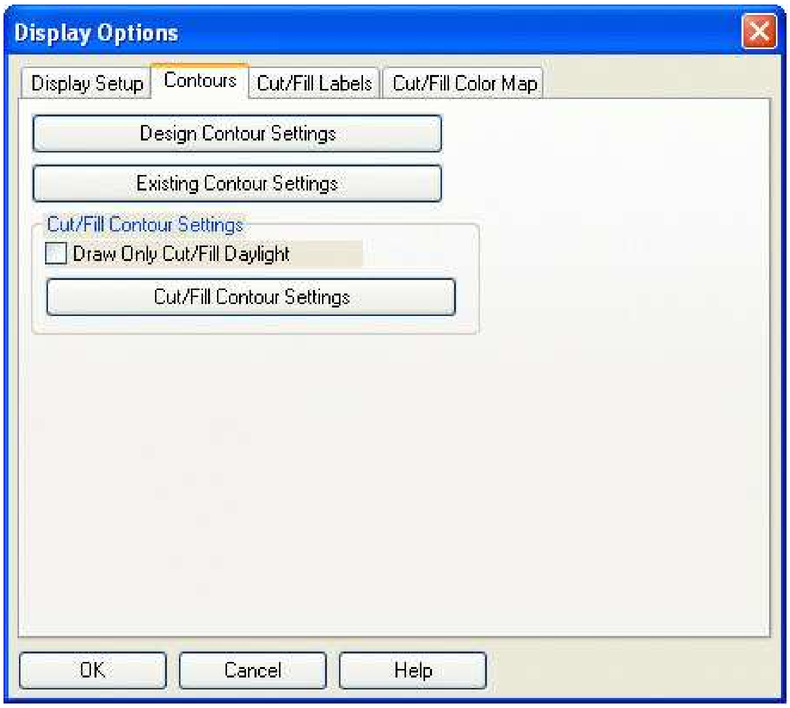
Existing Ground Surface Display
☑ Existing Drawing Entities
☐ Existing Contours
☐ Existing Surface

Cut/Fill Display
☐ Cut/Fill Contours
☐ Cut/Fill Labels
☐ Cut/Fill Color Map

Design Surface Display
☑ Design Drawing Entities
☐ Design Contours
☐ Design Surface

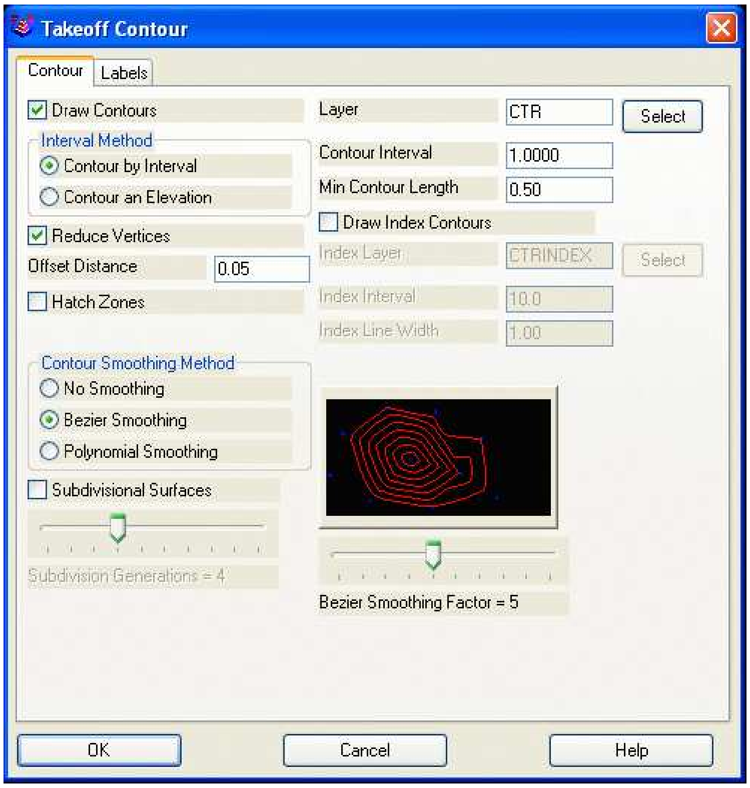
Other Display
☑ Other Drawing Entities

Display Setup: Here is the master list for the major things you can display, including: the Entities, Contours, and Surface for both the Existing and Design, Cut/Fill Displays, and Other Drawing Entities.


Display Options
Display Setup
Contours
Cut/Fill Labels
Cut/Fill Color Map
Design Contour Settings
Existing Contour Settings
Cut/Fill Contour Settings
OK
Cancel
Help

Cut/Fill Contour Settings
☐ Draw Only Cut/Fill Daylight

Contour Options: Here you can set the interval, the elevation difference between each contour, for the Existing, Design and Cut/Fill by clicking on their Contour Settings. You can also choose to draw only the daylight line between Existing and Design instead of the Cut/Fill contours at an interval.


Takeoff Contour

Contour | Labels

☑ Draw Contours

Interval Method

● Contour by Interval

○ Contour an Elevation

☑ Reduce Vertices

Offset Distance 0.05

☐ Hatch Zones

Contour Smoothing Method

○ No Smoothing

● Bezier Smoothing

○ Polynomial Smoothing

☐ Subdivisional Surfaces

Subdivision Generations = 4

Layer CTR

Contour Interval 1.0000

Min Contour Length 0.50

☐ Draw Index Contours

Index Layer CTRINDEX

Index Interval 10.0

Index Line Width 1.00

Bezier Smoothing Factor = 5

Draw Contours

When this box is checked, the program will draw contour lines after triangulating. Otherwise, only the designated triangulation operations are performed. Specify the layer for contours in the edit box to the right.

Contour by Interval or Contour an Elevation

Select whether to contour by interval (ie: every 10 feet) or to contour a certain elevation. The elevation option allows you to contour specific values. For example, if you want just the 100ft contour, then select elevation and enter 100. The default mode is by interval.

Contour Interval

Specify the interval to contour. Note: If the above option is set to Contour an Elevation, then this field is used to specify the elevation to contour.

Minimum Contour Length

Contour lines whose total length is less than this value will not be drawn.

Reduce Vertices

This option attempts to remove extra vertices from the contour polylines which has the advantages of a faster drawing and smaller drawing size. Default is ON

Offset Distance

When the Reduce Vertices option is enabled, This value is the maximum tolerance for shifting the original contour line in order to reduce vertices. The reduced contour polyline will shift no more than this value, at any point, away from the original contour line. A lower value will decrease the number of vertices removed and keep the contour line closer to the original. A higher value will remove more vertices and allows the contour line to shift more from the original.

Hatch Zones

When activated, this option will allow you to hatch the area between the contours sequentially. A secondary dialog will load allowing the user to specify the hatch type and color.

Draw Index Contours

This option creates highlighted contours at a specified interval. When enabled, the fields for Index Layer, Index Interval and Index Line Width are activated.

Contour Smoothing Method

Select the type of contour smoothing to be performed. Bezier smoothing holds all the contour points calculated from the triangulation and only smooths between the calculated points. Polynomial smoothing applies a fifth degree polynomial for smooth transition between the triangulation faces. The smoothing factor described below affects the smoothing bulge.

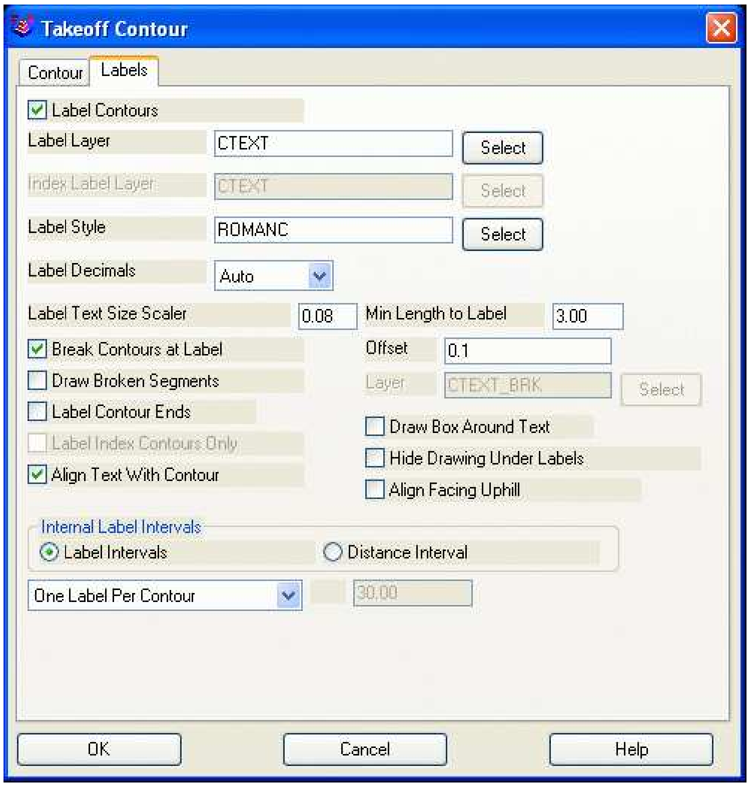
Bezier Smoothing Factor

The contour preview window shows you an example of how much smoothing can be expected at each setting. Sliding the bar to the left results in a lower setting which have less looping or less freedom to curve between contour line points. Likewise, moving the slider to the right results in a setting that increases the looping effect.

Subdivisional Surfaces / Subdivisions Generation

This option causes each triangle in the triangulation surface model to be subdivided into an average of three smaller triangles per subdivision generation, with the new temporary vertices raised or lowered to provide smoother contours. More generations increases the smoothness of the algorithm at a cost of increased processing time. If Straight Lines are chosen as the contouring drawing method, then the contours are guaranteed never to cross. The original points of the surface model are always preserved. These modifications to the surface model are only for contouring purposes and are not written to the triangulation (.FLT) file or inserted into the drawing. If some contour movement is too small for appearance's sake, consider enabling Reduce Vertices.

Label Tab



☑ Label Contours

Label Layer: CTEXT

Index Label Layer: CTEXT

Label Style: ROMANC

Label Decimals: Auto

Label Text Size Scaler: 0.08

Min Length to Label: 3.00

☑ Break Contours at Label

Offset: 0.1

☐ Draw Broken Segments

Layer: CTEXT_BRK

☐ Label Contour Ends

☐ Label Index Contours Only

☑ Align Text With Contour

☐ Draw Box Around Text

☐ Hide Drawing Under Labels

☐ Align Facing Uphill

Internal Label Intervals

● Label Intervals ○ Distance Interval

One Label Per Contour

30.00

Label Contours

When activated, contours will be labeled based on the settings below.

Label Layer

Specifies layer name for intermediate contour labels.

Index Label Layer

Specifies layer name for index contour labels.

Label Style

Specifies the text style that will be used for the contour label text.

Label Text Size Scaler

Specifies the size of the contour labels based on a multiplier of the horizontal scale.

Min Length to Label

Contours whose length is less than this value will not be labeled.

Break Contours at Label

When checked, contour lines will be broken and trimmed at the label location for label visibility. When enabled, the Offset box to the right activates. The Offset determines the gap between the end of the trimmed contour line and the beginning or ending of the text.

Draw Broken Segments

When checked, segments of contours that are broken out for label visibility will be redrawn as independent segments. Specify the layer for these broken segments in the box to the right of this toggle.

Label Contour Ends

When checked, contour ends will be labeled.

Draw Box Around Text

When checked, a rectangle will be drawn around contour elevation labels.

Label Index Contours Only

When checked, only the index contours will be labeled. This option is active only when "Draw Index Contours" has been selected in the Contour tab of the main dialog.

Hide Drawing Under Labels

This option activates a text wipeout feature that will create the appearance of trimmed segments at the contour label, even though the contour is fully intact. This feature provides the user with the best of both worlds; you have clean looking contour labels, and the contour lines themselves remain contiguous. This feature will also hide other entities that area in the immediate vicinity of the contour label.

Align Text with Contour

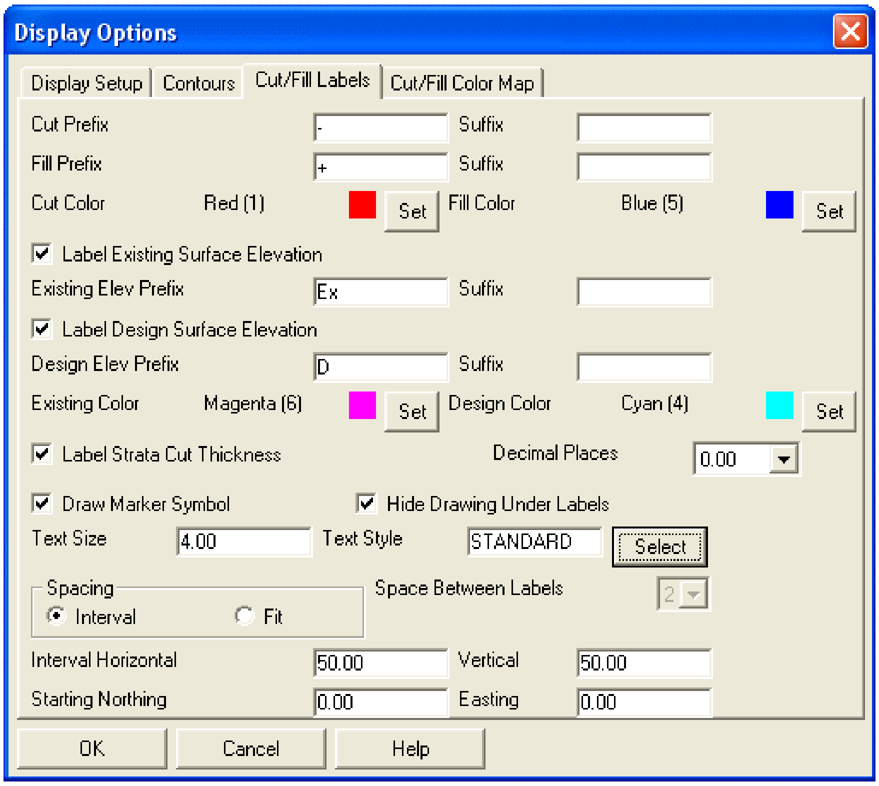
When checked, contour elevation labels will be rotated to align with their respective contour lines. This option also activates the Align Facing Uphill feature explained below.

Align Facing Uphill

When checked, contour elevation labels will still be rotated to align with their respective contour lines, but the labels will be flipped in such a manner that the bottom of the text label will always be toward the downhill side of the contours. So as the labels are read right side up, you are always facing uphill.

Internal Label Intervals

Choose between label intervals or distance interval. Label intervals will label each contour with a set number of labels. Distance interval lets you specify a distance between labels.



Cut Prefix - Suffix

Fill Prefix + Suffix

Cut Color Red (1) 🟥 Fill Color Blue (5) 🟦

☑ Label Existing Surface Elevation

Existing Elev Prefix Ex Suffix

☑ Label Design Surface Elevation

Design Elev Prefix D Suffix

Existing Color Magenta (6) Design Color Cyan (4)

☑ Label Strata Cut Thickness Decimal Places 0.00

☑ Draw Marker Symbol ☑ Hide Drawing Under Labels

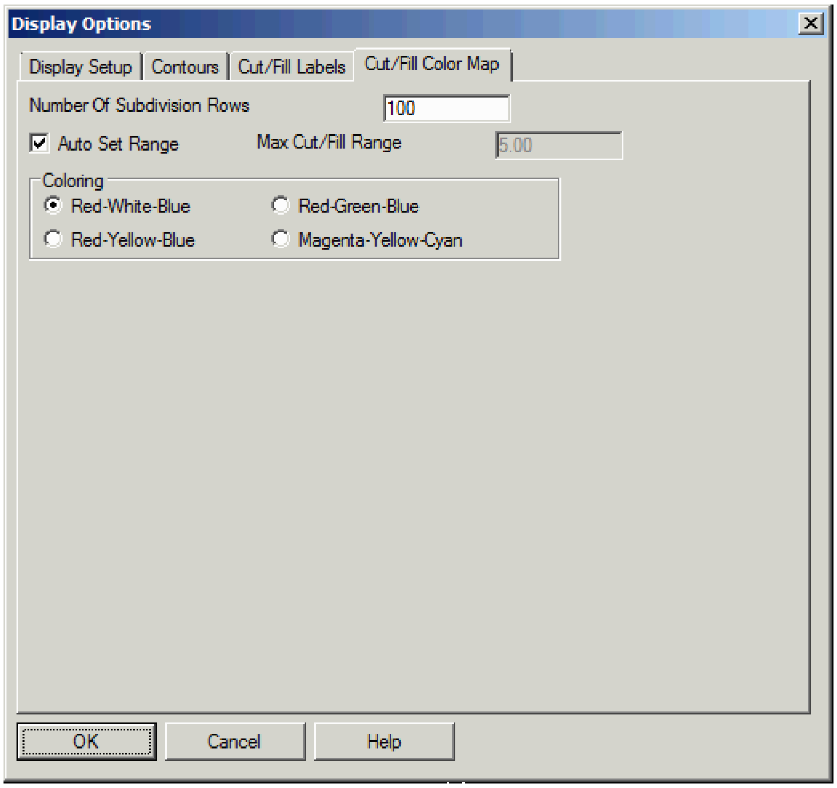
Text Size 4.00 Text Style STANDARD

Spacing ● Interval ○ Fit Space Between Labels 2

Interval Horizontal 50.00 Vertical 50.00

Starting Northing 0.00 Easting 0.00

Cut/Fill Label Options: Here you can customize the Cut/Fill labels. Text can be added either before or after the Cut/Fill amount, the Existing elevation, and the Design elevation with the Prefix and Suffix fields. You can also choose whether or not to display the Existing Surface elevations, the Design Surface elevations and Strata Cut Thickness. The colors for the Cut, Fill, Existing Elevation, and Design Elevation text are all customizable. Carlson TakeOff gives you the option to draw a marker symbol for where each label represents. You can also hide the drawing under the labels so that you can read the labels clearly. Text Size chooses the text size for each line of the label. Text Style allows you change the Font Style displayed in the labels. Decimal Places sets to how many decimal places the labels will report. The Spacing of the labels can be determined by intervals or by a selected number of spaces. The size of each space is determined by the Text Size.



Number Of Subdivision Rows: 100
☑ Auto Set Range
Max Cut/Fill Range: 5.00

Coloring
● Red-White-Blue
○ Red-Green-Blue
○ Red-Yellow-Blue
○ Magenta-Yellow-Cyan

Cut/Fill Color Map Options: Number Of Subdivision Rows is the number of blocks both horizontally and vertically in the Color Map. If the box reads 100 that means 100 blocks left to right and 100 blocks up and down or 10,000 total pixels. A higher the Number Of Subdivision Rows will make the Color Map sharper, however too high number can cause Carlson TakeOff to run slower. Auto Set Range will automatically set the red to blue scale for your cut/fill levels. However, if you desire greater contrast, then use Max Cut/Fill Range to manual set the range. Use lower numbers for greater contrast. There are several coloring schemes with different Cut-Daylight-Fill colors. For example, the Red-White-Blue scheme means red for cut, white for daylight and blue for fill.

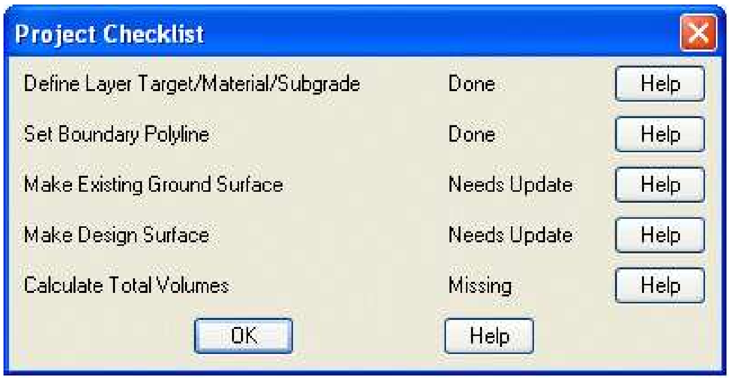
Keyboard Command: tk_display_options
Prerequisite: a drawing

Help Menu

18

Project Checklist

This command allows to check the status of steps needed to calculate total volumes.



Project Checklist

Define Layer Target/Material/Subgrade	Done
Set Boundary Polyline	Done
Make Existing Ground Surface	Needs Update
Make Design Surface	Needs Update
Calculate Total Volumes	Missing

Prerequisite: none
Keyboard Command: tk_checklist

On-Line Help

This command opens the Carlson TakeOff on-line Help File.

Prerequisite: None

Keyboard Command: [F1] or HELP

Training Movies

This command opens an application that lets you choose from several training movies. The movies provide instruction for all aspects of Carlson TakeOff.

Prerequisite: None

Keyboard Command: RUN_MOVIES

Carlson WebSite

This command brings you to the Carlson Home webpage.

Prerequisite: an internet connection
Keyboard Command: ._browser Enter Web location (URL) <http://www.carlsonsw.com>: "http://www.carlsonsw.com/"

About Carlson Takeoff

Displays the Carlson TakeOff version number, serial number, license information, and copyright information. You can run the registration wizard by clicking the Change Registration button on this dialog.

Prerequisite: None

Keyboard Command: ABOUT_SCAD

Tutorials Menu

19

Takeoff Tutorial: CAD File Takeoff From Start To Finish

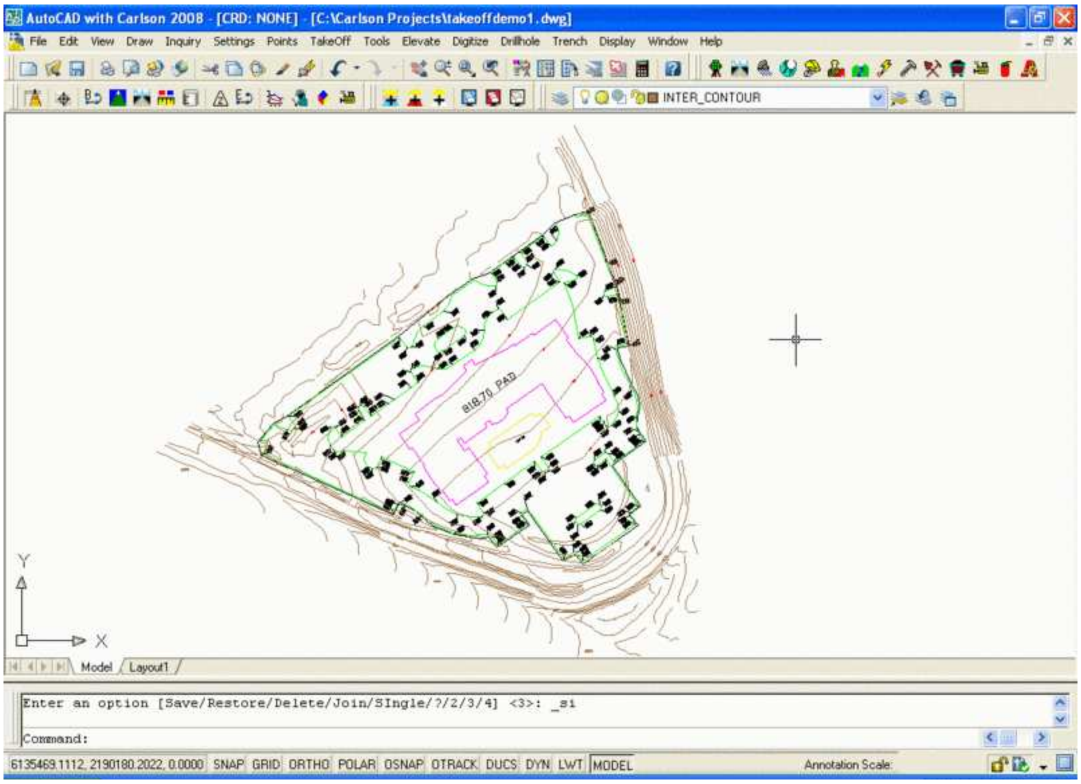
Note: Completing these tutorials will alter the drawing files (demo1.dwg, demo2.dwg, demo3.dwg). If you would like to run through the tutorials a second time, copy over the original drawing files (.dwg) into a new folder under C:\Carlson Projects.

Step 1 (Start Takeoff):

Click the icon for Takeoff on your desktop or from the toolbar to launch the program. You may be presented with a "Startup Wizard" dialog and if so, click Exit.

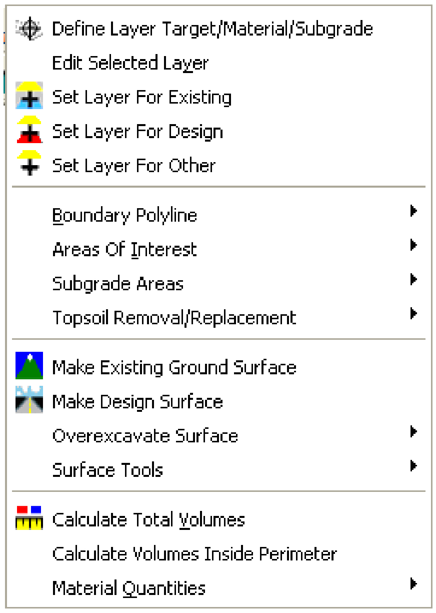
Step 2 (Open Drawing):

From the File menu, choose Open and select demo1.dwg from the Carlson Projects folder.


AutoCAD with Carlson 2008 - [CRD: NONE] - [C:\Carlson Projects\takeoffdemo1.dwg]
File Edit View Draw Inquiry Settings Points TakeOff Tools Elevate Digitize Drillhole Trench Display Window Help
INTER_CONTOUR
818.70 PAD
Y
X
Model
Layout1
6135469.1112, 2190180.2022, 0.0000 SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL
Annotation Scale:

```
Enter an option [Save/Restore/Delete/Join/SIngle/?/2/3/4] <3>: _si
Command:
```

Now we can begin to process this drawing. The main Takeoff commands are listed in processing sequence in the Takeoff pull-down menu. Many of these commands are also grouped as icons in the toolbar shown here.


Define Layer Target/Material/Subgrade
Edit Selected Layer
Set Layer For Existing
Set Layer For Design
Set Layer For Other
Boundary Polyline
Areas Of Interest
Subgrade Areas
Topsoil Removal/Replacement
Make Existing Ground Surface
Make Design Surface
Overexcavate Surface
Surface Tools
Calculate Total Volumes
Calculate Volumes Inside Perimeter
Material Quantities

Step 3 (Drawing Cleanup):

From the Takeoff pull-down menu, choose Drawing Cleanup. Typically, drawings have lots of drafting fixes that must be done before the surfaces can be modeled. This command will apply the selected cleanup functions on the drawing to help automate the cleanup. Here's a brief description of the most important of these functions:

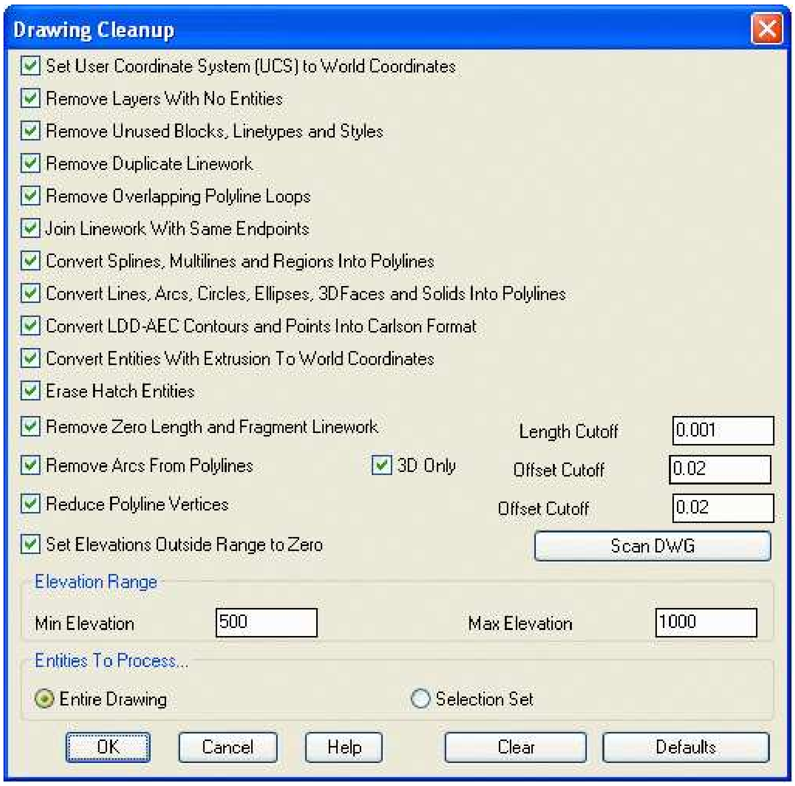
Remove Layers With No Entities: Drawings often have lots of layers. This routine removes layers that have no entities in the drawing so that we don't have to deal with them.

Join Linework With Same Endpoints: This routine will take linework that is broken into multiple segments and join them into a single linework entity. For example, it will join together broken segments of a contour polyline into a single polyline.

Reduce Polyline Vertices: This routine removes extra vertices from polylines as long as the removing does not shift the polyline more than the specified Offset Cutoff. This will reduce the size and complexity of the drawing.

Set Elevation Outside Range To Zero: In case the drawing contains entities that are outside the range of valid elevations for the site, this routine will set them to zero elevation. The program treats zero elevations as "no elevation" and modeling will filter out these zero elevation entities.

For this site, the elevations are around 800. So let's set the Min elevation to 500 and the Max elevation to 1000. The cleanup will set any entities outside this elevation range to zero. With other Takeoff functions, we can later assign proper elevations to any of these zero elevation entities that need to be used in modeling.

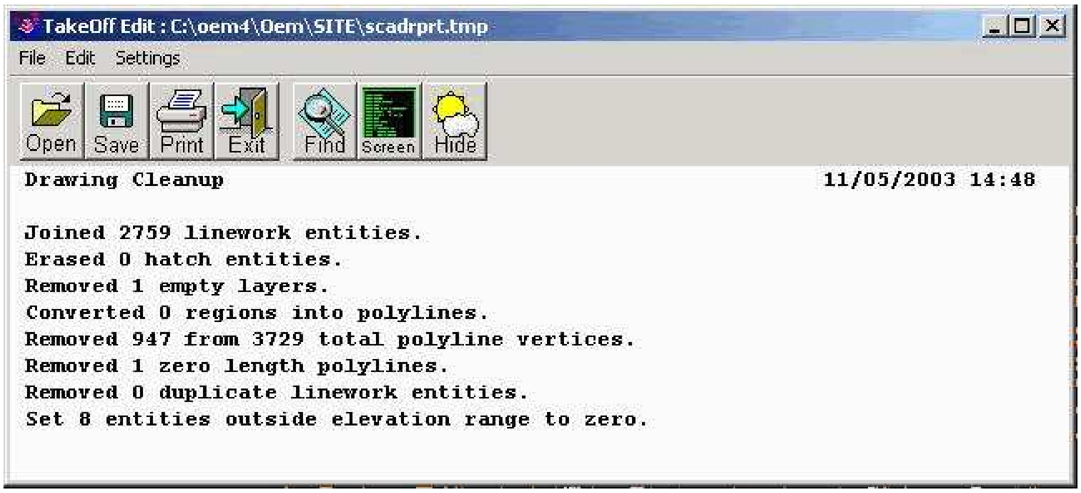


☑ Set User Coordinate System (UCS) to World Coordinates
☑ Remove Layers With No Entities
☑ Remove Unused Blocks, Linetypes and Styles
☑ Remove Duplicate Linework
☑ Remove Overlapping Polyline Loops
☑ Join Linework With Same Endpoints
☑ Convert Splines, Multilines and Regions Into Polylines
☑ Convert Lines, Arcs, Circles, Ellipses, 3DFaces and Solids Into Polylines
☑ Convert LDD-AEC Contours and Points Into Carlson Format
☑ Convert Entities With Extrusion To World Coordinates
☑ Erase Hatch Entities
☑ Remove Zero Length and Fragment Linework — Length Cutoff: 0.001
☑ Remove Arcs From Polylines ☑ 3D Only — Offset Cutoff: 0.02
☑ Reduce Polyline Vertices — Offset Cutoff: 0.02
☑ Set Elevations Outside Range to Zero

Elevation Range
Min Elevation: 500
Max Elevation: 1000

Entities To Process...
● Entire Drawing
○ Selection Set

Once the Drawing Cleanup options are set as shown, pick OK. When the cleanup is done, the program will show a report of the cleanup results. Pick the Exit button to exit the report viewer.



```
Drawing Cleanup                                          11/05/2003 14:48

Joined 2759 linework entities.
Erased 0 hatch entities.
Removed 1 empty layers.
Converted 0 regions into polylines.
Removed 947 from 3729 total polyline vertices.
Removed 1 zero length polylines.
Removed 0 duplicate linework entities.
Set 8 entities outside elevation range to zero.
```

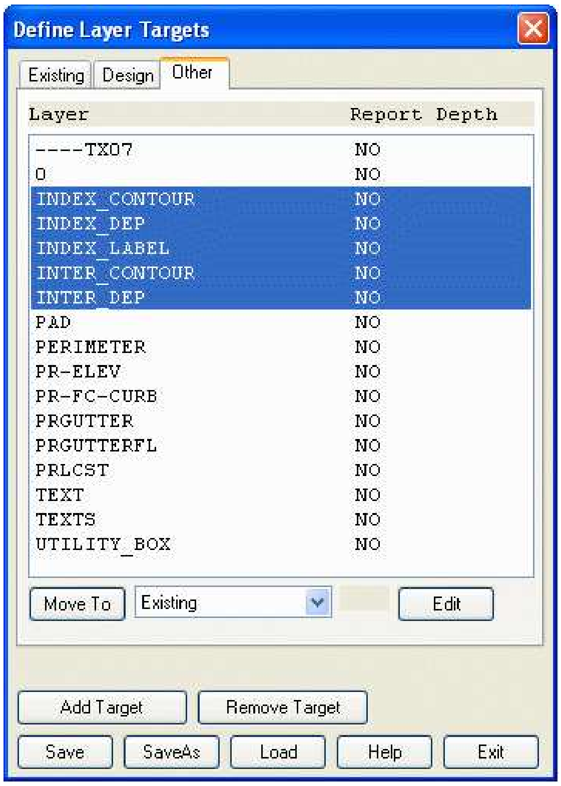
Step 4 (Layer Targets):

From the Takeoff menu, choose Define Layer Target/Material/Subgrade. Every entity (line, polyline, point, etc) in the drawing is assigned a layer name. Takeoff uses the entity layer names to define which entities are for the existing ground surface, the design surface or no surface. These surfaces are referred to as the "Target" surfaces. The drawing entities are assigned their target surface by their layer name. For example, if polylines representing design contours are on the layer "Final", then "Final" will be set as a layer for the design surface. For layers of entities that are for neither existing nor design surfaces (such as text labels for street names), the layer target is set to Other.

The Define Layer Targets dialog has three lists of layers: Existing, Design and Other. To switch between lists, pick the tabs at the top of the dialog.

In this drawing, all the contours are for the existing ground surface. In the layer list, all the layers that start with

INDEX and INTER are for these contours. So highlight these layers and then choose Move To Existing. To highlight multiple layers at a time, hold down the keyboard Ctrl key while picking with the mouse.


Define Layer Targets
Existing
Design
Other
Move To
Existing
Edit
Add Target
Remove Target
Save
SaveAs
Load
Help
Exit

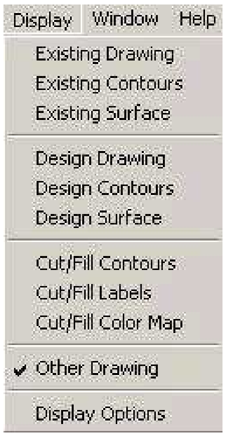
Layer	Report Depth
----TX07	NO
0	NO
INDEX_CONTOUR	NO
INDEX_DEP	NO
INDEX_LABEL	NO
INTER_CONTOUR	NO
INTER_DEP	NO
PAD	NO
PERIMETER	NO
PR-ELEV	NO
PR-FC-CURB	NO
PRGUTTER	NO
PRGUTTERFL	NO
PRLCST	NO
TEXT	NO
TEXTS	NO
UTILITY_BOX	NO

Next move the layer names that start with "PR" (for proposed) to the Design surface by highlighting these layers and choosing Move To Design. Also move the layer "PAD" to design.

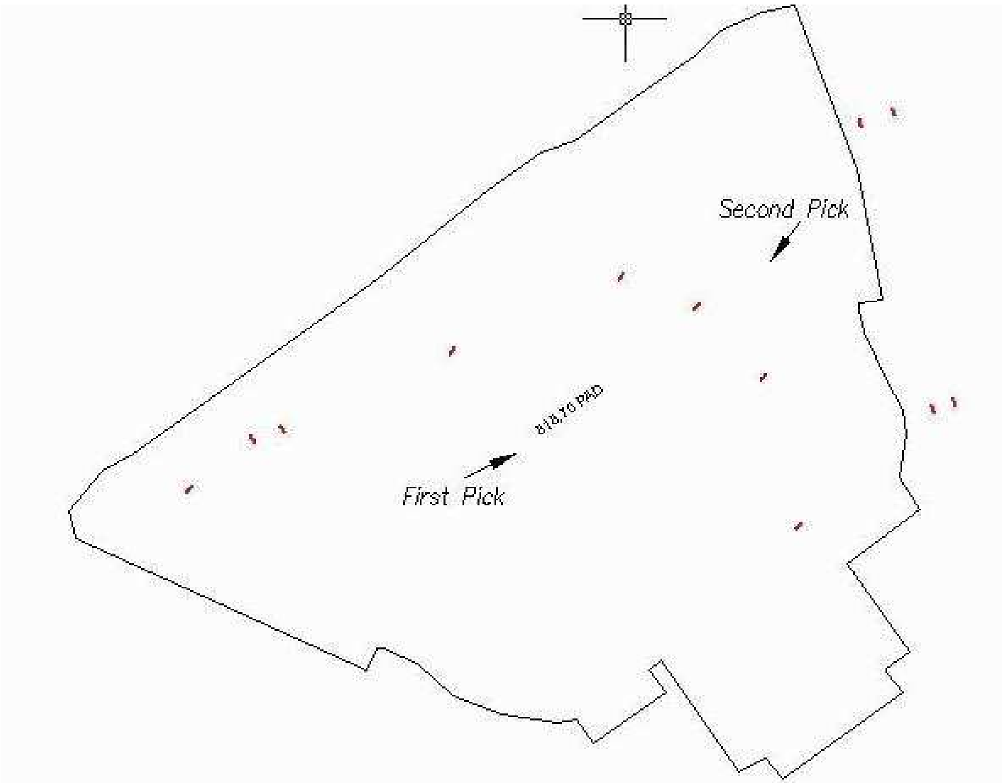
Next pick the Save button to save our changes and then pick Exit.

There are more tools for assigning layer targets. In the Display menu, you can turn on/off whether to display layer targets by using Existing Drawing, Design Drawing and Other Drawing. For example, when Design Drawing is checked, then picking this menu item will uncheck it and turn off all the layers for the design surface. Likewise, picking Design Drawing when it is unchecked will make it checked and turn on the design surface layers.

Practice turning on/off the Existing, Design and Other Drawing in the Display menu. When only Existing Drawing is on, you should see just the contours. When only Design Drawing is on, you should see just the design polylines and leader labels. When only Other Drawing is on, you should see the entities that are assigned to neither existing nor design.

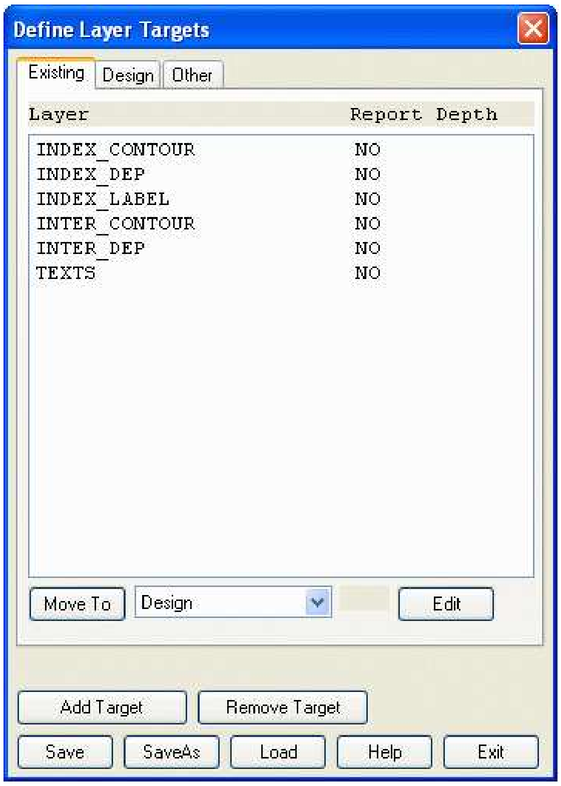

Display
Window
Help
Existing Drawing
Existing Contours
Existing Surface
Design Drawing
Design Contours
Design Surface
Cut/Fill Contours
Cut/Fill Labels
Cut/Fill Color Map
✓ Other Drawing
Display Options

Some of these layers we do want to assign to existing and design. To better see the entities, zoom in on them using the View->Zoom->Window command and pick two points that make a window around the entities as shown. Once zoomed in, you can see a text label of "818.70 PAD" which is for the design surface. Labels "817.00", "818.00" and "819.00" are contour labels for the existing contours.

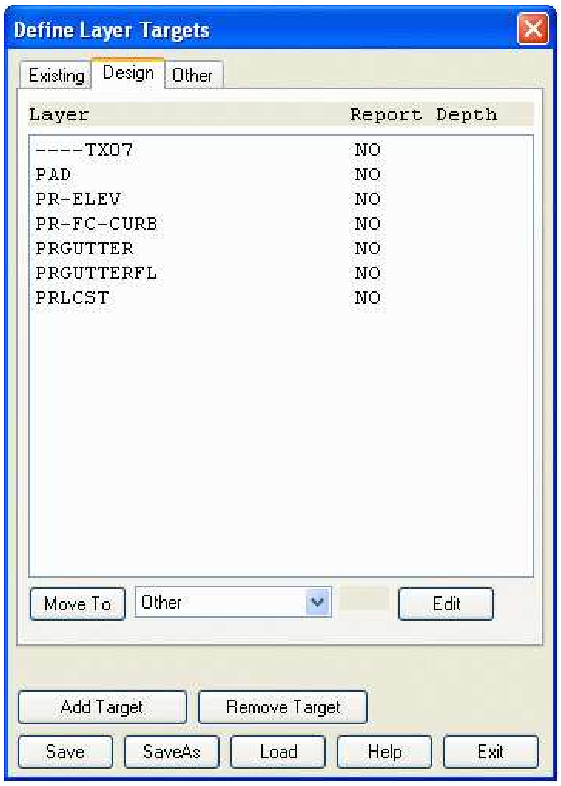


There are a few commands in the Inquiry menu to find out the layer names for these entities: List, Layer ID and Drawing Inspector. Let's run the Layer ID command and pick the "818.70 PAD" label. At the Command line, it reports this layer is "—-TX07". Next pick the "818.00" label and it reports this layer is "TEXTS". Now go up to the Takeoff Menu->Set Layer For Design and pick on label for the Building Pad. You will notice that if Design Drawing was checked off under Display, the Pad label will turn off. This is because the layer "—-TX07" is now apart of the Design Drawing. Go to the Takeoff Menu again and this time pick Set Layer For Existing and select the "TEXTS" layer. Press Enter, this will put the "TEXTS" layer on Existing.

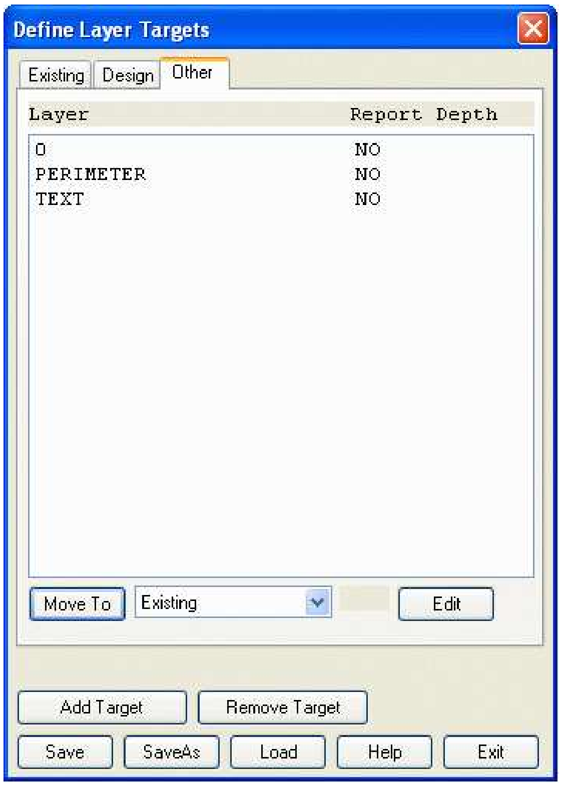
Next run Define Layer/Material/Subgrade and you will notice that "—-TX07" is now under Design and "TEXTS" is under Existing. Check that your Layer Targets match the three lists shown below. Then pick Save and Exit.


Define Layer Targets
Existing
Design
Other
Move To
Design
Edit
Add Target
Remove Target
Save
SaveAs
Load
Help
Exit

Layer	Report Depth
INDEX_CONTOUR	NO
INDEX_DEP	NO
INDEX_LABEL	NO
INTER_CONTOUR	NO
INTER_DEP	NO
TEXTS	NO


Define Layer Targets
Existing
Design
Other
Move To
Other
Edit
Add Target
Remove Target
Save
SaveAs
Load
Help
Exit

Layer	Report Depth
----TX07	NO
PAD	NO
PR-ELEV	NO
PR-FC-CURB	NO
PRGUTTER	NO
PRGUTTERFL	NO
PRLCST	NO



Layer	Report Depth
0	NO
PERIMETER	NO
TEXT	NO

Step 5 (Define Material/SubGrade):

Besides assigning target surfaces by layer, layers are also used to define material names and subgrades depths. By assigning material names and depths to layers, the volume, area, length and count for entities on these layers can be reported. Also the depth is used to vertically adjust the design surface. The polylines used for subgrade depth must be closed polylines. Takeoff supports nested subgrade polylines for exclusion areas such as islands by counting how many subgrade polylines surround an area. If the number is odd, then the area is inside the subgrade. Otherwise the area is not part of the subgrade.

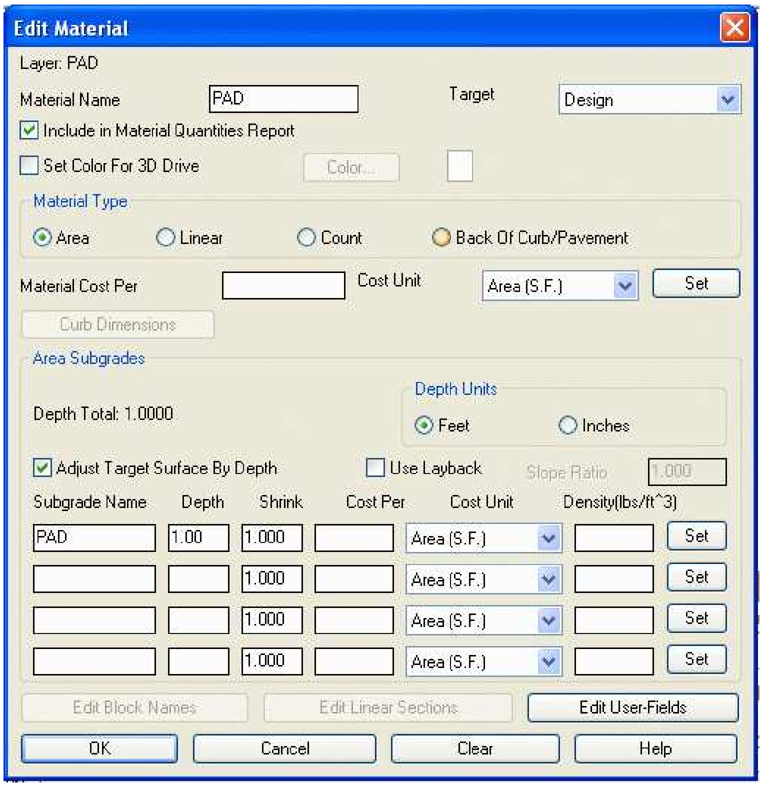
<>First, we need to know the layer names for our subgrades. Go to the Display menu and check on Design Drawing, uncheck Existing Drawing and uncheck Other Drawing. Then run Inquiry->Layer ID and pick the large pad polyline. It reports that this layer is PAD. Next use Layer ID to pick the curb polyline. It reports that this layer is PR-FC-CURB.

Next we need to make sure that these polylines are closed. In this example, the outside curb polyline is open at the top. To close the polylines, run Edit->Polyline Utilities->Edit Polyline->Close Polylines or pick on the Toolbar icon . Then pick each of the pad and curb polylines and press Enter when done selecting. Here are the Command line prompts:

```
Select Polylines to set closed.
Select objects: 1 found
Select objects: 1 found, 2 total
Select objects: 1 found, 3 total
Select objects: 1 found, 4 total
Select objects: 1 found, 5 total
Select objects: 1 found, 6 total
Select objects: (Press Enter)
5 polylines already closed.
```

Closed 1 polylines.

Now run Define Layer Target/Material/Subgrade and pick the Design tab. Highlight layer PAD and pick the Edit button. A dialog appears for defining the pad material properties. Check on the Include In Material Report option, enter the Material Name as "Pad", set the first subgrade name to "Pad", and set the Depth as 1. Once the dialog is filled out as shown, pick OK.



Layer: PAD

Material Name: PAD

Target: Design

☑ Include in Material Quantities Report

☐ Set Color For 3D Drive

Material Type: ● Area ○ Linear ○ Count ○ Back Of Curb/Pavement

Material Cost Per:

Cost Unit: Area (S.F.) Set

Area Subgrades

Depth Total: 1.0000

Depth Units: ● Feet ○ Inches

☑ Adjust Target Surface By Depth

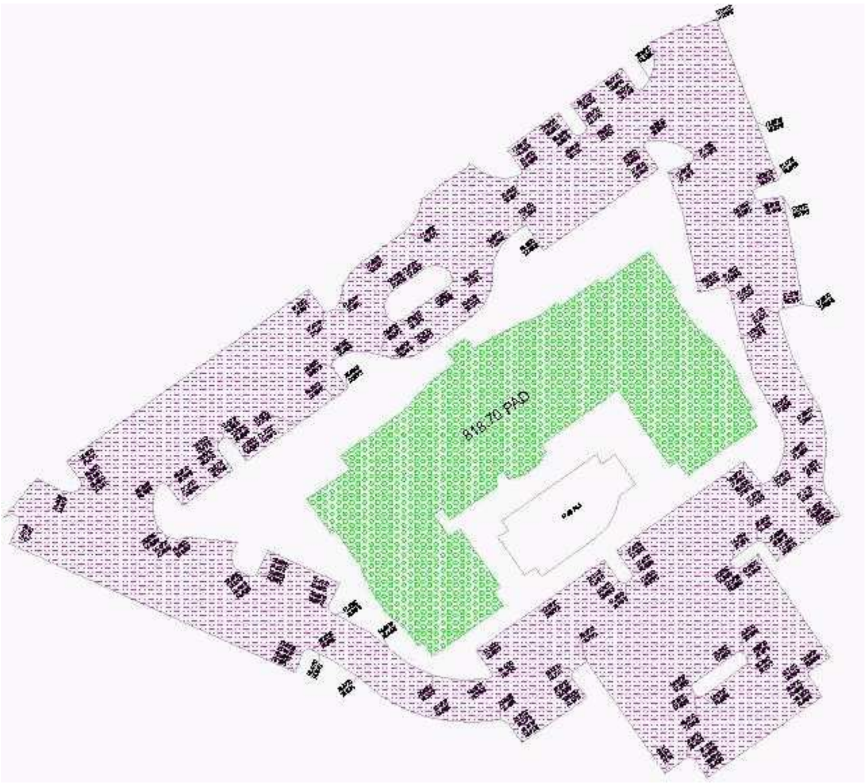
☐ Use Layback Slope Ratio 1.000

Subgrade Name	Depth	Shrink	Cost Per	Cost Unit	Density(lbs/ft^3)	
PAD	1.00	1.000		Area (S.F.)		Set
		1.000		Area (S.F.)		Set
		1.000		Area (S.F.)		Set
		1.000		Area (S.F.)		Set

Next pick layer PR-FC-CURB and choose Edit. In the Edit Materials dialog, check on Include In Material Report, set the Material Name to "Pavement", set the first subgrade name to "Pavement", and set the Depth to 1.5. Then pick OK.

<>To save the subgrade changes, pick the Save button on the Define Layer Targets dialog. Then choose Exit.

Now let's visually verify the subgrade areas. In the Takeoff menu, run Subgrade Areas->Hatch Subgrade Areas. There is a dialog to select which subgrade to hatch. Choose the Pavement. Then there is a dialog for the hatch pattern and color. Click OK. Then run Hatch Subgrade Areas again. This time choose Pad and set the hatch pattern to Hex with green color. The resulting hatch areas show where the subgrade is applied. Notice how the islands are not hatched because they are curb polylines that are already inside another curb polyline. Also note that the smaller pad area is not hatched because this polyline layer is different than the bigger pad polyline. When finished viewing the subgrade areas, run Takeoff->Subgrade Areas->Erase Subgrade Hatches.



Step 6 (Elevate Drawing - 2D to 3D):

Takeoff will model the existing ground and design surfaces based on points, lines and polylines with elevation. It is essential for these drawing entities to have correct elevations in order to get correct surface models. Often the provided drawings will have the drawing entities at elevation of zero with text labels indicating the true elevation. Takeoff has many tools for assigning elevations to these entities.

<>To help visualize which entities need to be assigned elevation, Takeoff will color entities at zero elevation in grey. As entities get assigned elevation, they return to their original color. This elevation coloring is applied to layers that have been assigned to the existing or design surfaces.

Let's start by working on the existing surface. To isolate the existing entities, go to the Display menu and check on Existing Drawing, uncheck Design Drawing and uncheck Other Drawing. In the Inquiry menu, there are commands for checking elevations. To check the elevation of the contour polylines, run the Inquiry->List Elevation and pick a contour polyline At the command line, it reports the elevation.

Select Entity: pick pad polyline

Elevation: 816.0000

Select Entity (Enter to end): press Enter

In this example, the existing ground surface is defined by just contour polylines and these polylines already have elevation. So there are no changes needed for preparing the existing surface entities. If the contour polylines were at zero elevation, then you could use the Elevate->Assign Contour Elevation commands.

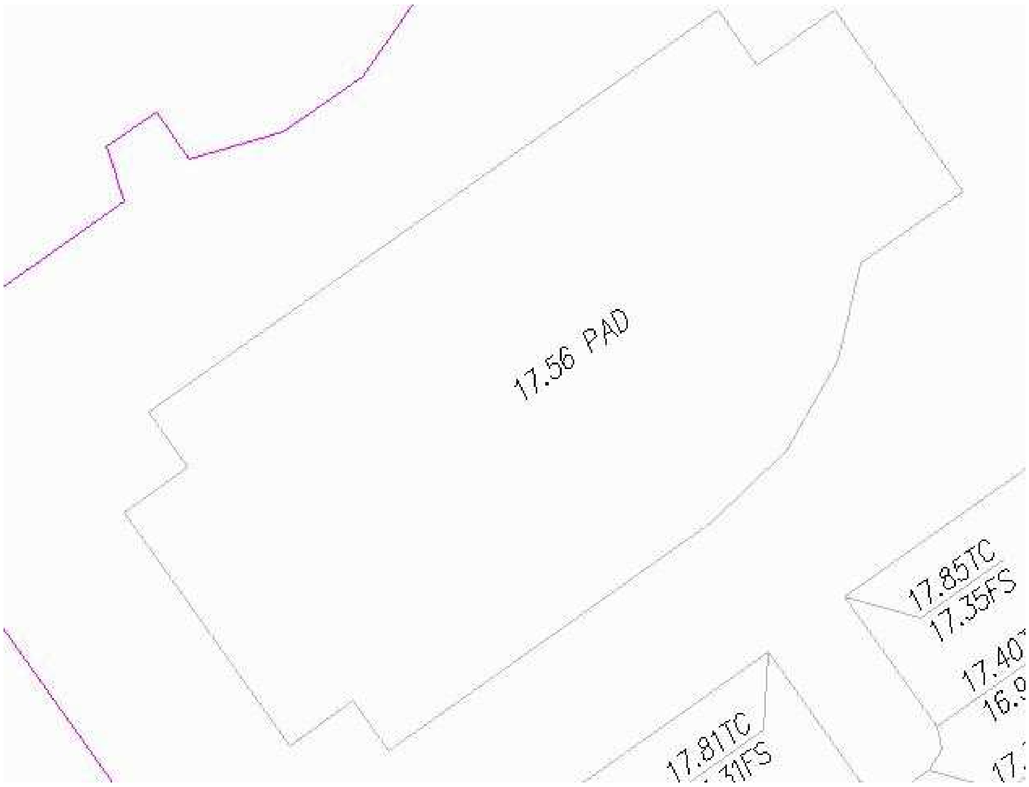
Next let's prepare the design surface. To isolate the design entities, go to the Display menu and check on Design Drawing, uncheck Existing Drawing and uncheck Other Drawing. Notice that all the design linework is greyed because it is at zero elevation. Run the List Elevation command and pick the main pad polyline. At the command line, it confirms that the elevation is 0.

To set the pad polyline elevation, run Elevate->Set Polyline To Elevation. Enter an elevation of 818.7 (based on the text label). At the Select objects prompt, pick the bigger pad polyline and press Enter.

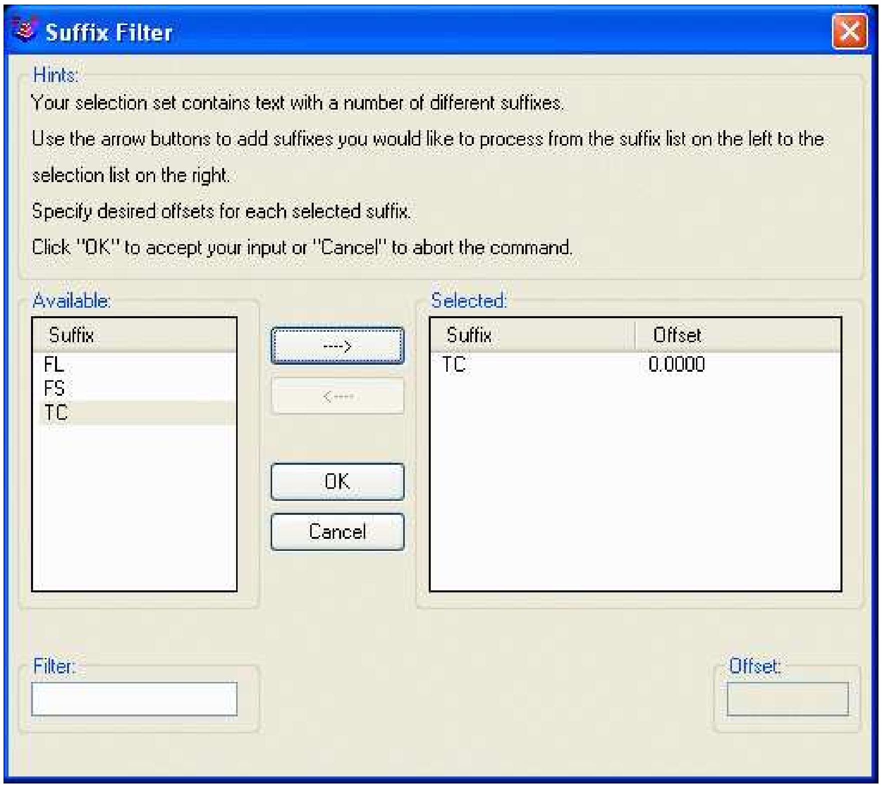
New Elevation <0.0000>: 818.7

```
Select Lines, Arcs, Circles or Polylines for elevation change.

Select objects: (pick the pad polyline) 1 found

Select objects: press Enter

LWPOLYLINE

Number of entities changed> 1
```

Next let's set the elevation of the smaller pad under the main pad. First, use View->Zoom->Window to zoom in around the smaller pad so that we can read the text label. The label of "17.56" is short for 817.56. In this example, the 800 was dropped from many of the elevation labels to save on label clutter. Run Set Polyline To Elevation again. This time enter an elevation of 817.56 and pick the smaller pad polyline. Then run View->Zoom->Previous to get back to the full view of the site.



Finally, we need to set the elevations for the curb polylines. First, use View->Zoom->Window to zoom in around some of the curb labels below the smaller pad. Then run Elevate->2D to 3D Polyline->Text With Leader. This command will assign the elevations from the labels to the polylines by following the label leader to find the position on the polyline. For polyline vertices without elevation labels, the elevations will be interpolated from the other labels. Before processing, this routine prompts for samples of the elevation label, the leader and the polylines to convert. Then you can select all the entities in the drawing and the routine will sort the labels, leaders and polyline by the sample layers and assign the elevations. For this example, pick one of the labels with a "TC" suffix as the elevation text sample. Then pick the leader line for the annotation leader sample. Then pick the curb polyline for the polyline to convert sample. At the Select objects prompt for processing, type "all" to select all the drawing entities and press Enter. For the elevation to add, enter 800 so that labels like "17.81" get assigned as 817.81.


Suffix Filter

Hints:

Your selection set contains text with a number of different suffixes.

Use the arrow buttons to add suffixes you would like to process from the suffix list on the left to the selection list on the right.

Specify desired offsets for each selected suffix.

Click "OK" to accept your input or "Cancel" to abort the command.

Available:

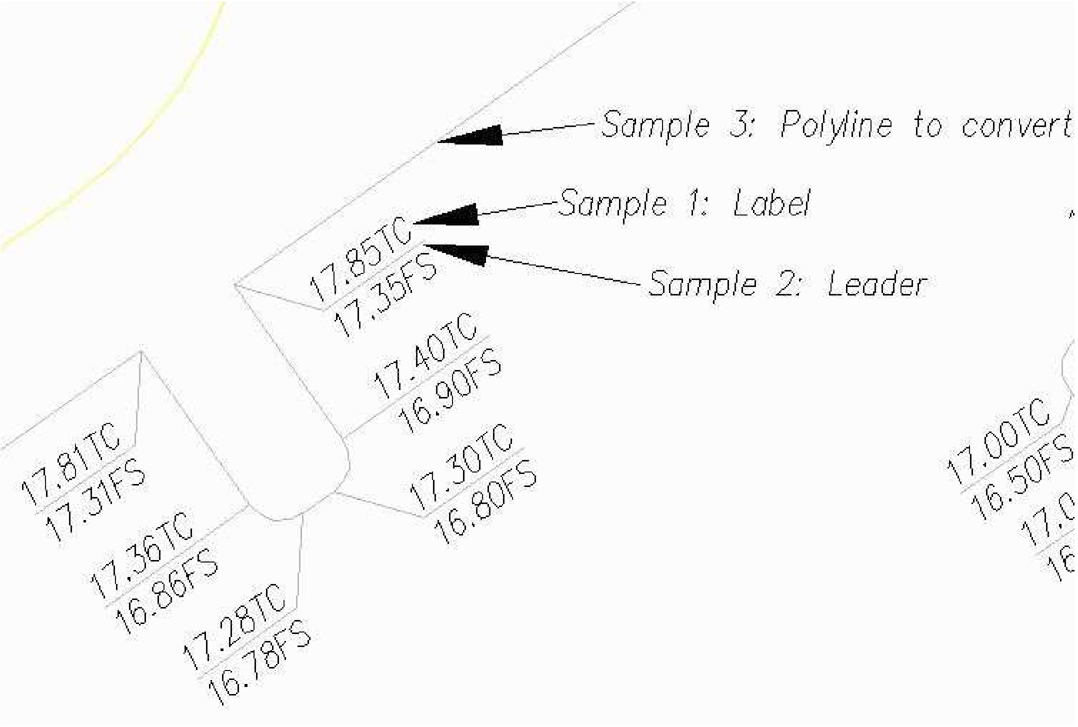
Suffix
FL
FS
TC

Selected:

Suffix	Offset
TC	0.0000

--->
<---
OK
Cancel
Filter:
Offset:

Next a dialog appears for selecting which labels names to use. When Takeoff detects different text labels within the elevation labels, you need to choose which ones to process. In this case, we only want the labels with "TC". So highlight TC, pick Add and then pick OK.


Sample 3: Polyline to convert
Sample 1: Label
Sample 2: Leader
17.85TC
17.35FS
17.40TC
16.90FS
17.30TC
16.80FS
17.81TC
17.31FS
17.36TC
16.86FS
17.28TC
16.78FS
17.00TC
16.50FS

Select sample of elevation text: pick label

Select sample of an annotation leader: pick leader line

Select sample of a polyline to convert: pick curb polyline

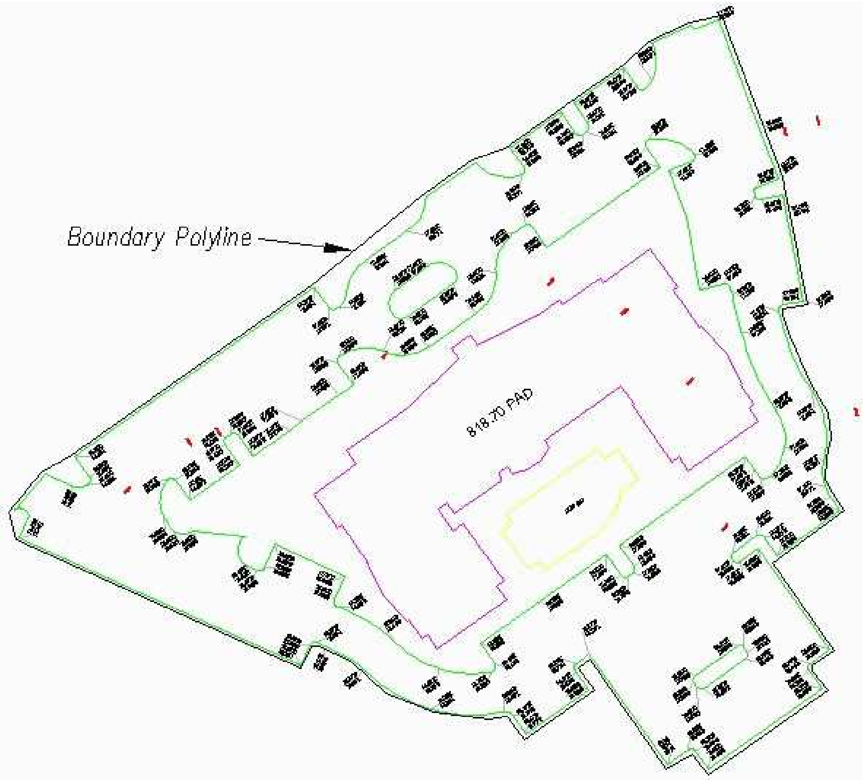
Select polylines to convert, leaders and elevation labels to process.

```
Select objects: all
Select objects: press Enter
Joining adjacent polylines...
Reading the selection set ...
Enter elevation to add to label values <0.00>: 800
Pre-processing entity #420 of 420
Processing leader #141
Remaking polyline #4
All the curb polylines now have elevations.
```

<>Now run View->Zoom->Previous to return to the full site view. The design polylines should now have colors because the elevations are assigned.

Step 7 (Boundary Polyline):

The limits of the site are defined by a closed polyline. This polyline is used as the boundary for the models and the volumes. In this example, there is a closed polyline on the PERIMETER layer. The layer target for this layer is Other. Go to the Display menu and check on Other Drawing so that the perimeter is displayed. Then run Takeoff->Boundary Polyline->Set Boundary Polyline and pick the perimeter polyline. This selected polyline is now set as the boundary polyline for the rest of the Takeoff routines.

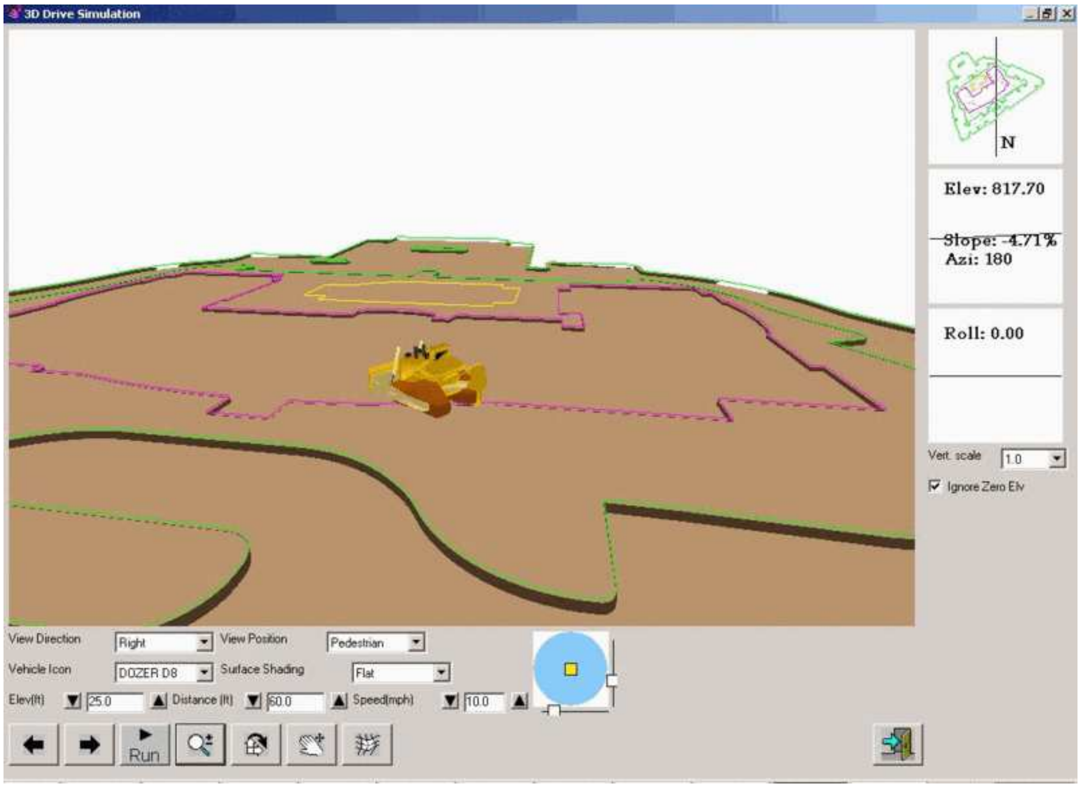


Step 8 (Model Existing and Design Surfaces):

To calculate volumes, Takeoff needs two surfaces: existing ground and design. These surfaces are modeled by triangulation. With the preparation of the previous steps, we're now ready to make the models. The drawing entities have been cleaned up, assigned elevations and assigned target surfaces by layer. Making the models is now a one step process. To make the existing ground surface, run Takeoff->Make Existing Ground Surface. The program will process the entities and make the triangulation surface. Then to make the design surface, run Takeoff->Make Design Surface.

Step 9 (3D Drive Simulation):

As a visual check that the design surface modeled correctly, let's run the Tools->3D Drive Simulation command. This routine shows a 3D view of the site and allows you to drive around. This is a good way to check that the surface modeled correctly. We want to make sure that there are no elevation spikes and that the subgrade depths are modeled. To drive the site, choose a View Direction, View Position and Vehicle. Then pick the Run button and use the arrow keys to turn. Pick the Stop button to pause the moving. You can also try the Surface Shading options for different views of the surface. When done with the 3D Drive Simulation, pick the Exit button (Arrow with door image).



Elev: 817.70

Slope: -4.71%
Azi: 180

Roll: 0.00

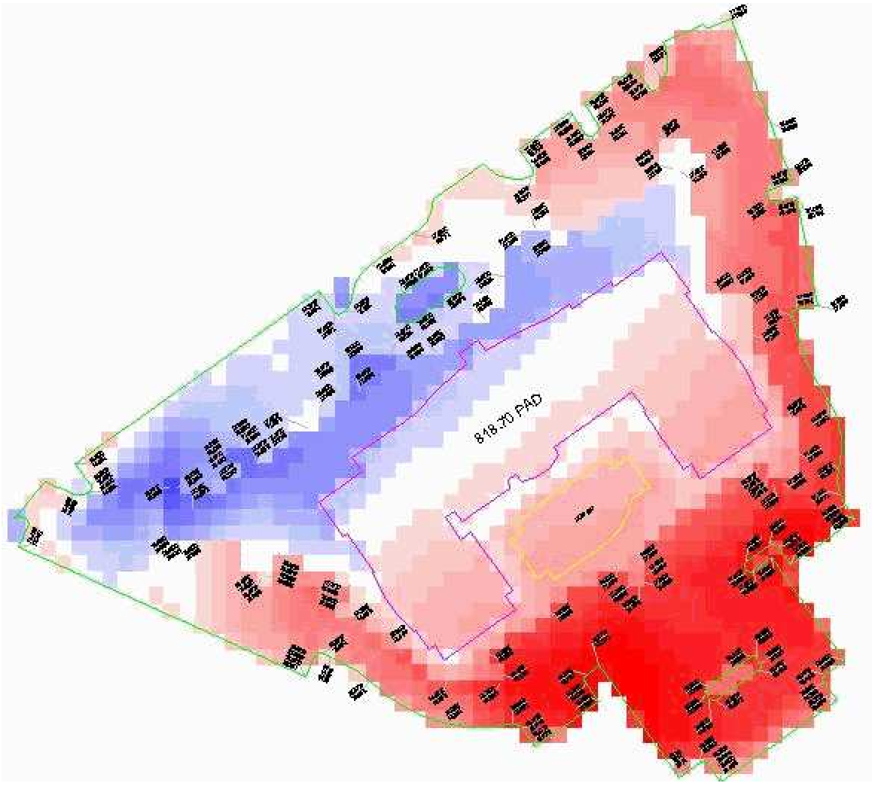
Vert. scale: 1.0

☑ Ignore Zero Elv

View Direction: Right
View Position: Pedestrian
Vehicle Icon: DOZER D8
Surface Shading: Flat
Elev(ft): 25.0
Distance (ft): 60.0
Speed(mph): 10.0

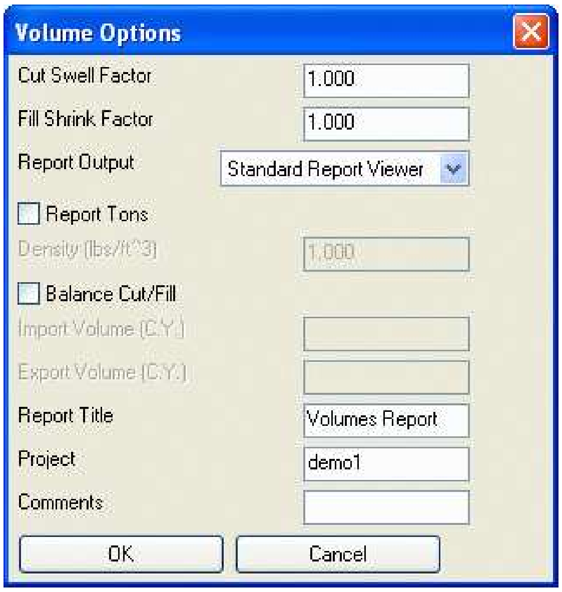
Step 10 (Cut/Fill Color Map):

Cut/Fill color maps can be used for a visual output of the site cut/fill areas and also serves as another check that the models are correct. In the Display menu, choose Cut/Fill Color Map. Cut areas are drawn in different shades of red for different depths of cut while fill areas are drawn in blue. To change the resolution of the color blocks, run Display->Display Options and change the Cut/Fill Color Map Subdivisions. This parameter is the number of rows and columns of color blocks to create. To turn off the color map, go to the Display menu and pick Cut/Fill Color Map to uncheck it.



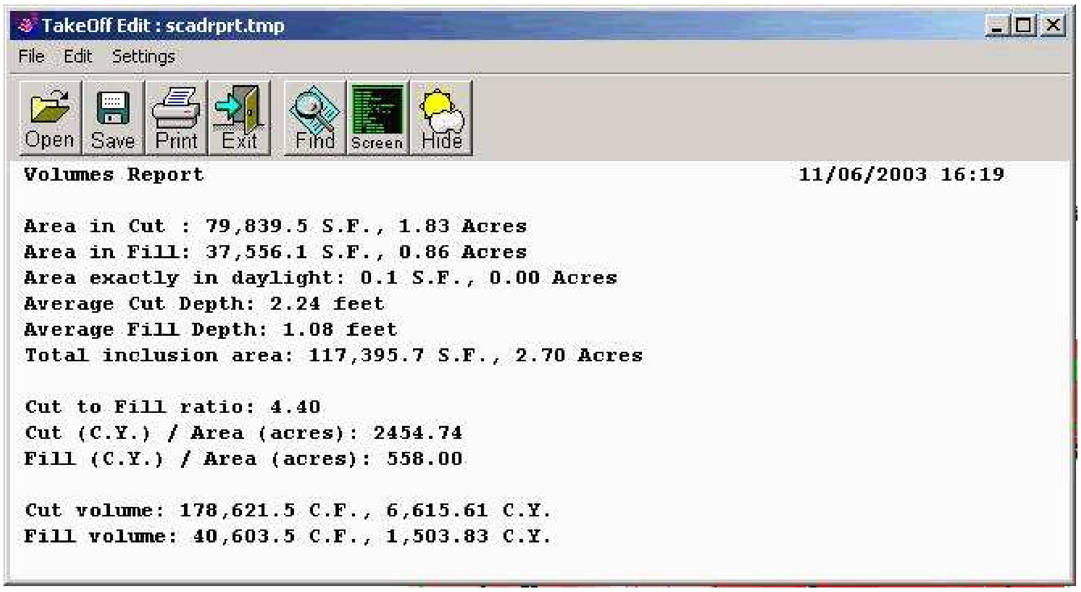
Step 11 (Calculate Volumes):

To calculate volumes, run the Takeoff->Calculate Total Volumes command. There is an options dialog for setting the cut swell factor and fill shrink factor. These values get multiplied into the cut/fill volumes. Set these factors as desired and click OK. Then the routine calculates the volumes and display the report which includes the cut/fill volumes and areas. The report can be printed or saved to a file. Pick the Exit button to exit the report viewer.



Volume Options

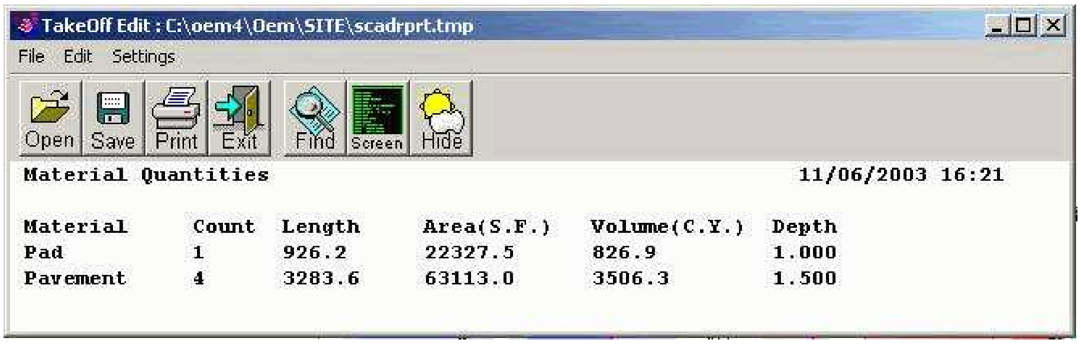
Cut Swell Factor: 1.000
Fill Shrink Factor: 1.000
Report Output: Standard Report Viewer
☐ Report Tons
Density (lbs/ft^3): 1.000
☐ Balance Cut/Fill
Import Volume (C.Y.):
Export Volume (C.Y.):
Report Title: Volumes Report
Project: demo1
Comments:


TakeOff Edit : scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Volumes Report                                              11/06/2003 16:19

Area in Cut : 79,839.5 S.F., 1.83 Acres
Area in Fill: 37,556.1 S.F., 0.86 Acres
Area exactly in daylight: 0.1 S.F., 0.00 Acres
Average Cut Depth: 2.24 feet
Average Fill Depth: 1.08 feet
Total inclusion area: 117,395.7 S.F., 2.70 Acres

Cut to Fill ratio: 4.40
Cut (C.Y.) / Area (acres): 2454.74
Fill (C.Y.) / Area (acres): 558.00

Cut volume: 178,621.5 C.F., 6,615.61 C.Y.
Fill volume: 40,603.5 C.F., 1,503.83 C.Y.
```

Step 12 (Material Quantities):

To report the quantities, run the Takeoff->Material Quantities->Standard Report routine. The report includes the count, length, area and volume for each type of material that was assigned for reporting in the Define Layer Target/Material/Subgrade command. The Material Quantities->Custom Report routine can be used to reporting these values with control of the report format and the option to export to Excel.


TakeOff Edit : C:\oem4\Oem\SITE\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Material Quantities                                         11/06/2003 16:21

Material      Count  Length     Area(S.F.)    Volume(C.Y.)  Depth
Pad           1      926.2      22327.5       826.9         1.000
Pavement      4      3283.6     63113.0       3506.3        1.500
```

Takeoff Tutorial: Road Design with Volumes

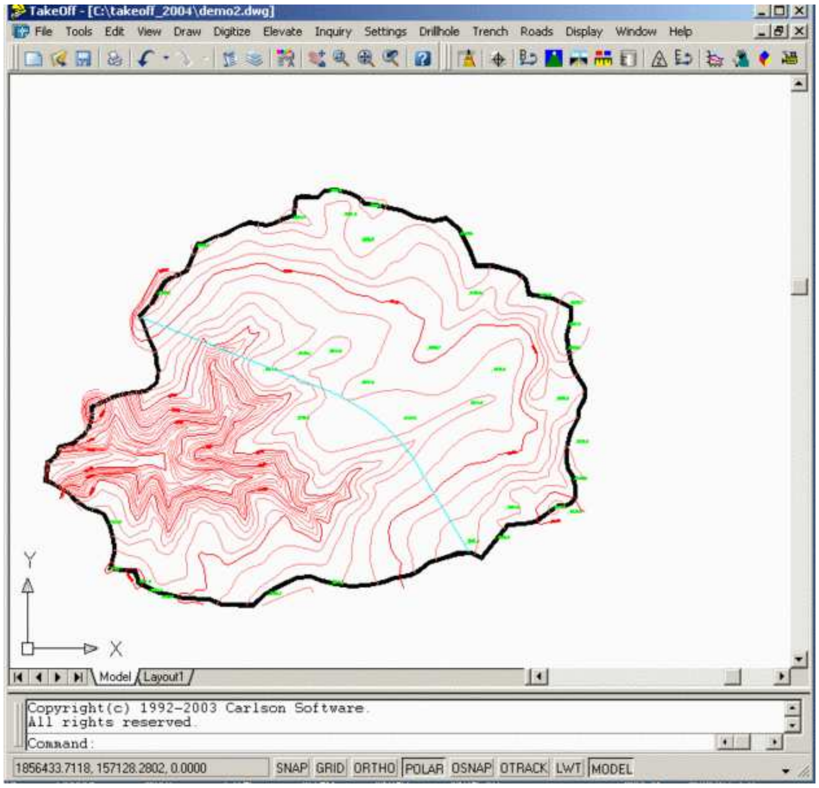
This lesson takes a drawing file through the steps of road design.

Step 1 (Start Takeoff):

Click the Windows icon for Takeoff to launch the program. You may be presented with a "Startup Wizard" dialog and if so, click Exit.

Step 2 (Open Drawing):

From the File menu, choose Open and select DEMO2.dwg from the Takeoff Work folder (ie. C:\Program_files\Carlson_Takeoff_2004\WORK\DEMO2.dwg).


TakeOff - [C:\takeoff_2004\demo2.dwg]
File Tools Edit View Draw Digitize Elevate Inquiry Settings Drillhole Trench Roads Display Window Help
Y
X
Model
Layout1
SNAP GRID ORTHO POLAR OSNAP OTRACK LWT MODEL

```
Copyright(c) 1992-2003 Carlson Software.
All rights reserved.
Command:
```

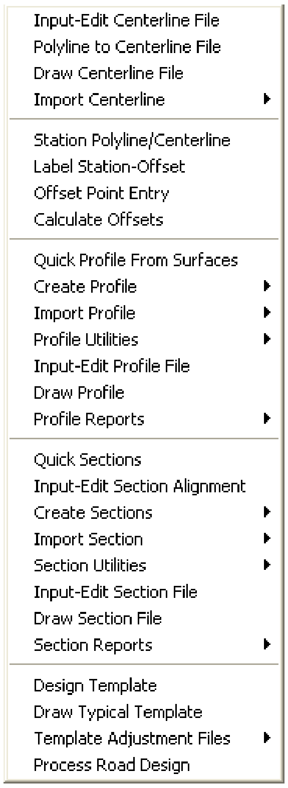
```
1856433.7118, 157128.2802, 0.0000
```

Step 3 (Existing Ground Surface):

For the road cut/fill slopes to be created, it needs the existing ground surface to tie into. First we need to define the layers of the existing ground surface. Run Takeoff-> Set Layer For Existing, pick on both a light-lined and heavy-lined contour, a spot elevation, and press Enter. This will set the layers CTR, CTRINDEX, and TO-PREM-SPOT-PNT to the existing surface. The limits of the site are defined by a closed polyline. Run Takeoff->Boundary Polyline->Set Boundary Polyline and pick the black polyline around the perimeter. This selected polyline is now set as the boundary polyline for the existing surface. To make the existing ground surface, run Takeoff->Make Existing Ground Surface.

Step 4 (Creating a Centerline):

Now we will use commands under the Roads menu.


Input-Edit Centerline File
Polyline to Centerline File
Draw Centerline File
Import Centerline
Station Polyline/Centerline
Label Station-Offset
Offset Point Entry
Calculate Offsets
Quick Profile From Surfaces
Create Profile
Import Profile
Profile Utilities
Input-Edit Profile File
Draw Profile
Profile Reports
Quick Sections
Input-Edit Section Alignment
Create Sections
Import Section
Section Utilities
Input-Edit Section File
Draw Section File
Section Reports
Design Template
Draw Typical Template
Template Adjustment Files
Process Road Design

Notice that the Roads menu is broken down into four sections: Centerline commands, Profile commands, Section commands, and Template commands. A road needs design input from all four sections to be created. It does not matter in what order the commands are run, but in this example we will run the commands in descending order.

A centerline file is necessary for the final road design routine. We will do the simplest variation, which is picking a polyline. There are other methods to design a centerline, and they are documented in the manual. Go to Polyline to Centerline File in the first grouping of commands under Roads. A file selection dialog will appear. Enter a centerline file name of demo2.cl and pick save. Follow the prompting:

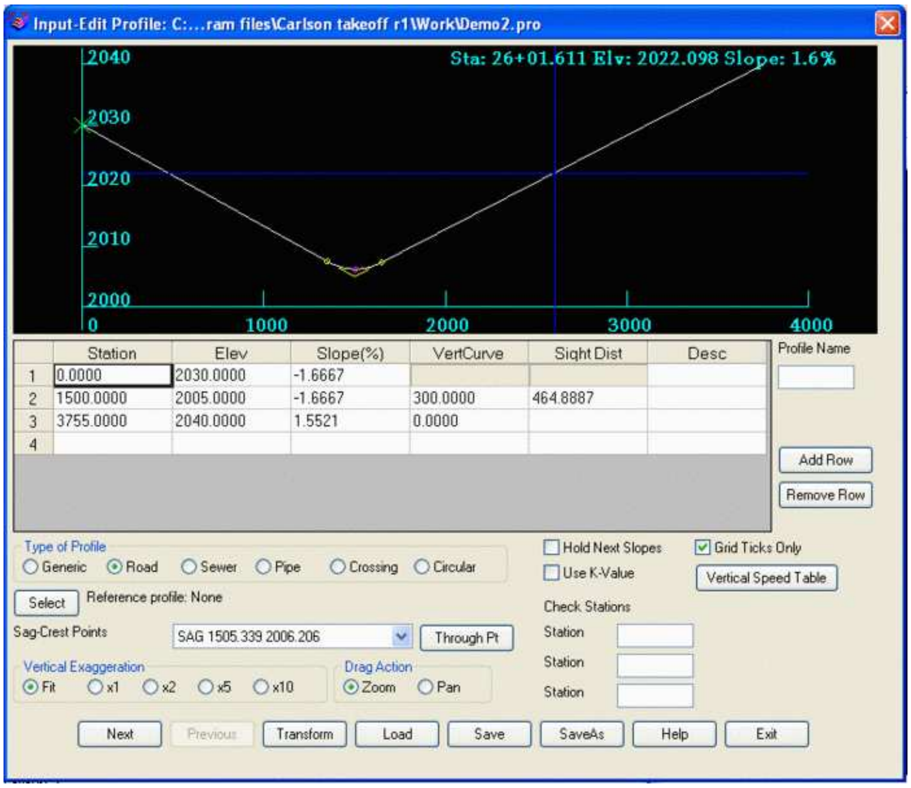
Beginning Station <0+00>: Press Enter
Polyline should have been drawn in direction of increasing stations.
Select polyline that represents centerline: Select the polyline that crosses the middle of the site with the layer name CLINE.

```
Station North(y) East(x) Description
________________________________________
0.0000 159718.2034 1857460.9166 LI
1798.2055 159058.6315 1859133.7908 PC
2912.2263 158347.2903 1859964.4134 LI
3755.6840 157619.5351 1860390.7855 LI
Press ENTER to continue.
```

Your Command Line should have the same values as these, as they are from the same line. Hit the F2 key or press Enter to return to the main screen.

Step 5 (Input-Edit Profile):

In this routine we will create a Profile file. There are different ways to define a road profile. In this case we will enter values from a given design. Go to Roads-> Input-Edit Profile File, create a new file, and name it Roaddemo. The Input-Edit Profile window will be displayed. Under Type of Profile select Road from the dialog box. In the spreadsheet, you can add design features for the Profile of the road. In this example, enter in the stations 0.0, 1500.0, and 3755.6840, with elevations of 2030, 2005, and 2040. Next, set the Vertical Curve for the middle station at 300.0.


2040
2030
2020
2010
2000
0
1000
2000
3000
4000
Profile Name
Add Row
Remove Row
Select
Through Pt
Vertical Speed Table
Next
Previous
Transform
Load
Save
SaveAs
Help
Exit

Input-Edit Profile: C:...ram files\Carlson takeoff r1\Work\Demo2.pro

Sta: 26+01.611 Elv: 2022.098 Slope: 1.6%

	Station	Elev	Slope(%)	VertCurve	Sight Dist	Desc
1	0.0000	2030.0000	-1.6667			
2	1500.0000	2005.0000	-1.6667	300.0000	464.8887	
3	3755.0000	2040.0000	1.5521	0.0000		
4						

Type of Profile: ○ Generic ● Road ○ Sewer ○ Pipe ○ Crossing ○ Circular

Reference profile: None

Sag-Crest Points: SAG 1505.339 2006.206

Vertical Exaggeration: ● Fit ○ x1 ○ x2 ○ x5 ○ x10

Drag Action: ● Zoom ○ Pan

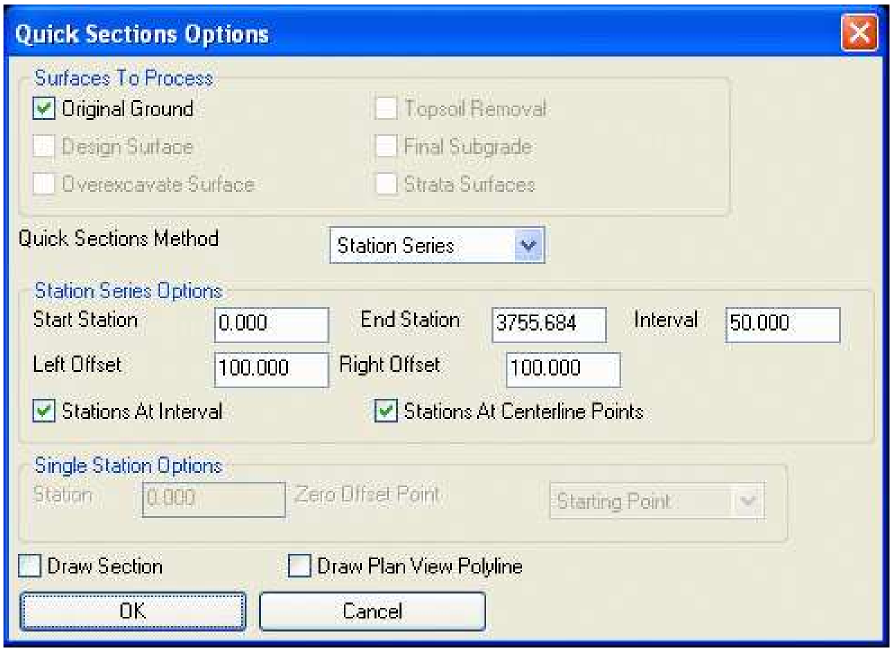
☐ Hold Next Slopes
☐ Use K-Value
☑ Grid Ticks Only

Check Stations
Station
Station
Station

The Slope Percentages and the Sight Distances are automatically computed for you. Select Save and Exit.

Step 6 (Quick Section):

Now we will create the cross section file (∗.SCT). The cross sections define the existing ground for the road to tie into. Run Roads->Quick Section, fill the dialog as shown, and click OK. Your Offsets should be far enough away to tie in the Cut/Fill slopes.



Quick Sections Options

Surfaces To Process
☑ Original Ground
☐ Design Surface
☐ Overexcavate Surface
☐ Topsoil Removal
☐ Final Subgrade
☐ Strata Surfaces

Quick Sections Method: Station Series

Station Series Options
Start Station: 0.000
End Station: 3755.684
Interval: 50.000
Left Offset: 100.000
Right Offset: 100.000
☑ Stations At Interval
☑ Stations At Centerline Points

Single Station Options
Station: 0.000
Zero Offset Point: Starting Point

☐ Draw Section
☐ Draw Plan View Polyline

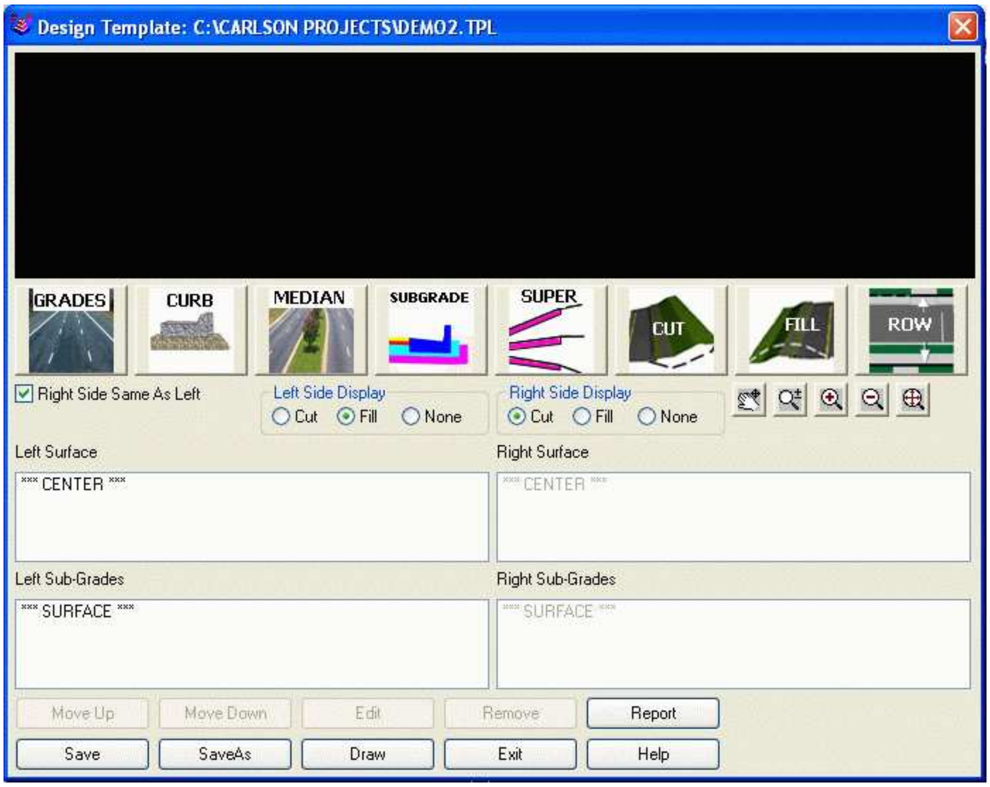
Next, you will be prompted to load a centerline file or to to pick a polyline from the screen. Type C for Centerline and select the demo2.cl file we created earlier. Your section file is now created, your Command line should read as follows:

```
Command: quicksct

Pick starting point (CL-Centerline,P-Polyline): c

Polyline should have been drawn in direction of increasing stations.
Loading edges...
Loaded 4244 points and 12207 edges
Created 7964 triangles

Writing section C:\Takeoff_2004\demo2a-og.sct
```

Step 7 (Design Template):

Let's design a wide boulevard with curb and gutter on the outside. The cut slope will be 2:1. In fill, the condition will be 3:1 in all fill under 6' and 2:1 in all fill over 6' in depth. Pavement depths will be 4" of asphalt.

First, select Design Template under Roads, name the .TPL file demo2, and open it. A dialog appears where you enter segments of the template. We will enter a symmetrical template, with 13.5' pavement sections on either side of the centerline, connecting to a 2' curb and gutter, with 18" of gutter and 6" of curb. Then we'll add a 6' shoulder.



Design Template: C:\CARLSON PROJECTS\DEMO2.TPL

☑ Right Side Same As Left

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ● Cut ○ Fill ○ None

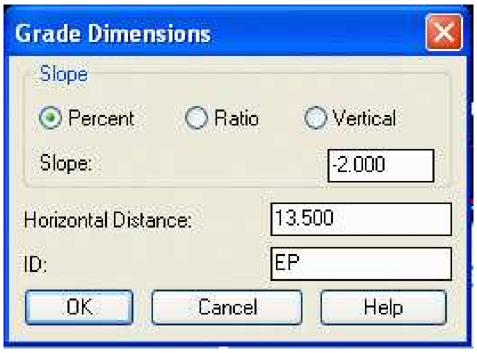
Left Surface: *** CENTER ***

Right Surface: *** CENTER ***

Left Sub-Grades: *** SURFACE ***

Right Sub-Grades: *** SURFACE ***

For the lanes, click the Grades Icon.



Grade Dimensions

Slope

● Percent ○ Ratio ○ Vertical

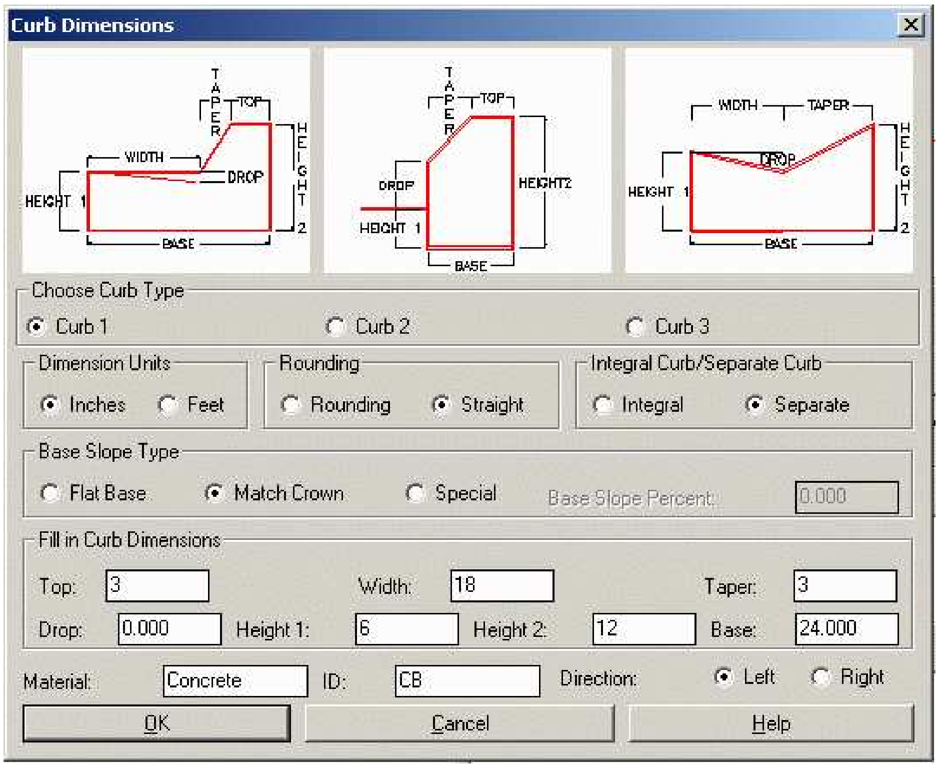
Slope: -2.000

Horizontal Distance: 13.500

ID: EP

The above 'child' dialog is shown, enter in: Slope: -2, Horizontal Distance: 13.5, and ID: EP. Click OK. You'll note that the lanes draw in the little preview window.

Click on the Curb Icon. Fill out as shown below and click OK.



Curb Dimensions

Choose Curb Type

● Curb 1 ○ Curb 2 ○ Curb 3

Dimension Units

● Inches ○ Feet

Rounding

○ Rounding ● Straight

Integral Curb/Separate Curb

○ Integral ● Separate

Base Slope Type

○ Flat Base ● Match Crown ○ Special

Base Slope Percent: 0.000

Fill in Curb Dimensions

Top: 3

Width: 18

Taper: 3

Drop: 0.000

Height 1: 6

Height 2: 12

Base: 24.000

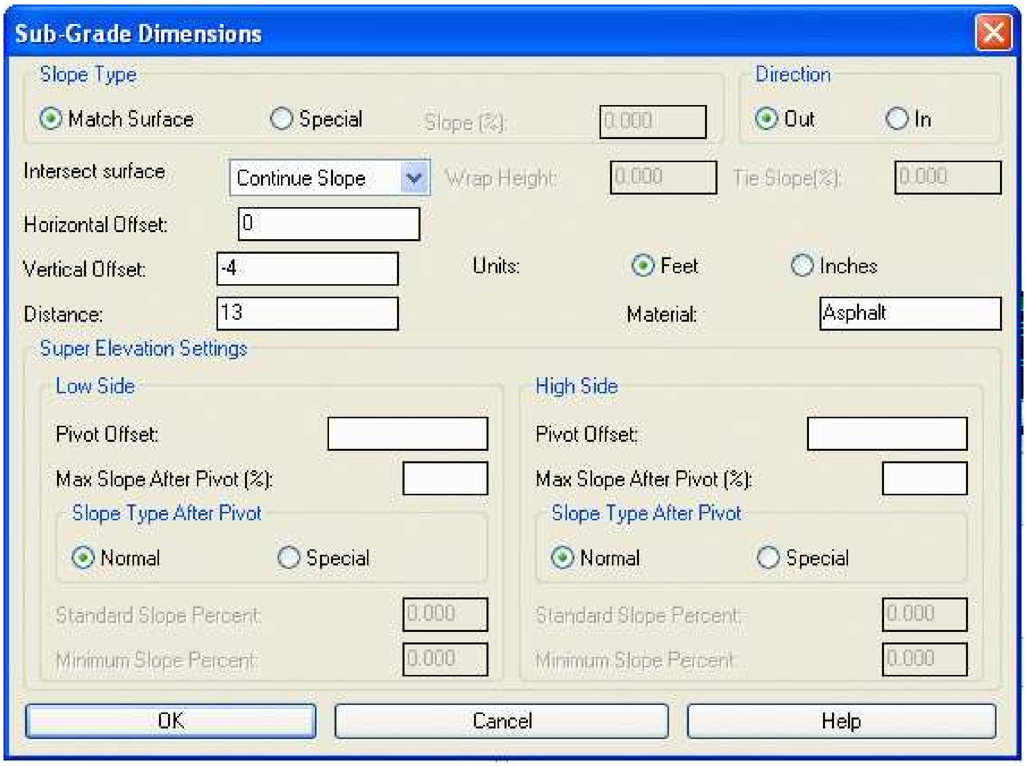
Material: Concrete

ID: CB

Direction: ● Left ○ Right

Next up, we will add a shoulder, going up hill at 4% for 8'. Click on Grades again and enter in a slope of 4, a Horizontal Distance of 8, and the ID as SH.

We are now finished with the surface and can set subgrade. Select the Subgrade icon, second from the right (yellow color). We will create an asphalt subgrade which will run straight out and hit the curb.



Sub-Grade Dimensions

Slope Type: ● Match Surface ○ Special Slope (%): 0.000

Direction: ● Out ○ In

Intersect surface: Continue Slope

Wrap Height: 0.000

Tie Slope(%): 0.000

Horizontal Offset: 0

Vertical Offset: -4

Units: ● Feet ○ Inches

Distance: 13

Material: Asphalt

Super Elevation Settings

Low Side

Pivot Offset:

Max Slope After Pivot (%):

Slope Type After Pivot: ● Normal ○ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

High Side

Pivot Offset:

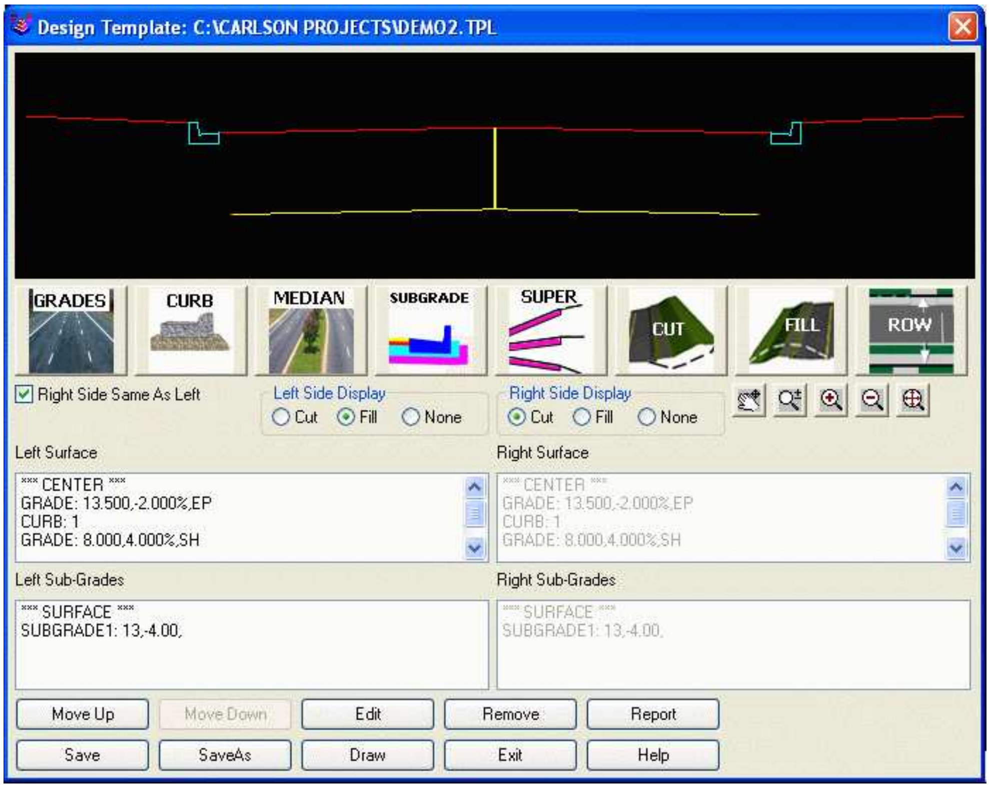
Max Slope After Pivot (%):

Slope Type After Pivot: ● Normal ○ Special

Standard Slope Percent: 0.000

Minimum Slope Percent: 0.000

Complete as shown and click OK. Here's what our template looks like so far:



Design Template: C:\CARLSON PROJECTS\DEMO2.TPL

☑ Right Side Same As Left

Left Side Display: ○ Cut ● Fill ○ None

Right Side Display: ● Cut ○ Fill ○ None

Left Surface

```
*** CENTER ***
GRADE: 13.500,-2.000%,EP
CURB: 1
GRADE: 8.000,4.000%,SH
```

Right Surface

```
*** CENTER ***
GRADE: 13.500,-2.000%,EP
CURB: 1
GRADE: 8.000,4.000%,SH
```

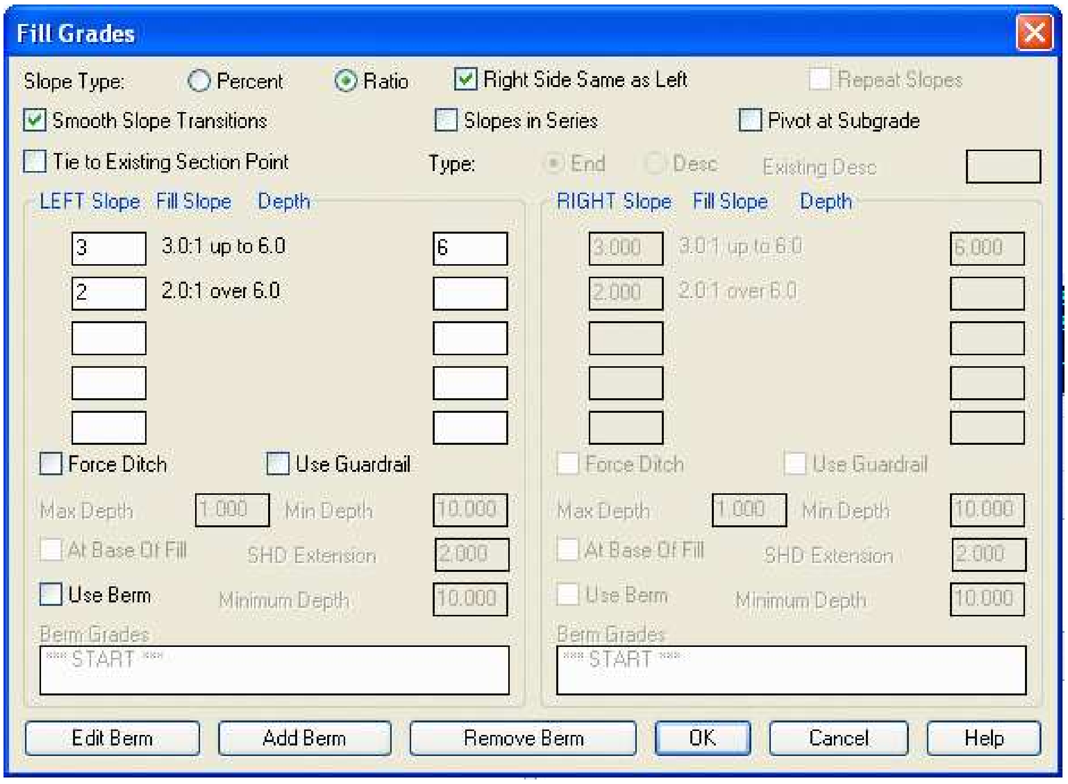
Left Sub-Grades

```
*** SURFACE ***
SUBGRADE1: 13,-4.00,
```

Right Sub-Grades

```
*** SURFACE ***
SUBGRADE1: 13,-4.00,
```

Now we will add the outslope conditions. They are done with the Cut and Fill icons. Click on Fill and make three entries: under LEFT Slope enter in 3 (for 3:1), under Depth enter 6 (up to 6'), then again under LEFT Slope enter in 2 (for 2:1 over 6'). Select OK and click the icon for Cut. Just one entry here: under LEFT Slope enter in 2 (for 2:1 normal cut). Click OK.



Fill Grades

Slope Type: ○ Percent ● Ratio ☑ Right Side Same as Left ☐ Repeat Slopes

☑ Smooth Slope Transitions ☐ Slopes in Series ☐ Pivot at Subgrade

☐ Tie to Existing Section Point Type: ● End ○ Desc Existing Desc

LEFT Slope Fill Slope Depth

3 3.0:1 up to 6.0 6

2 2.0:1 over 6.0

☐ Force Ditch ☐ Use Guardrail

Max Depth 1.000 Min Depth 10.000

☐ At Base Of Fill SHD Extension 2.000

☐ Use Berm Minimum Depth 10.000

Berm Grades

*** START ***

RIGHT Slope Fill Slope Depth

3.000 3.0:1 up to 6.0 6.000

2.000 2.0:1 over 6.0

☐ Force Ditch ☐ Use Guardrail

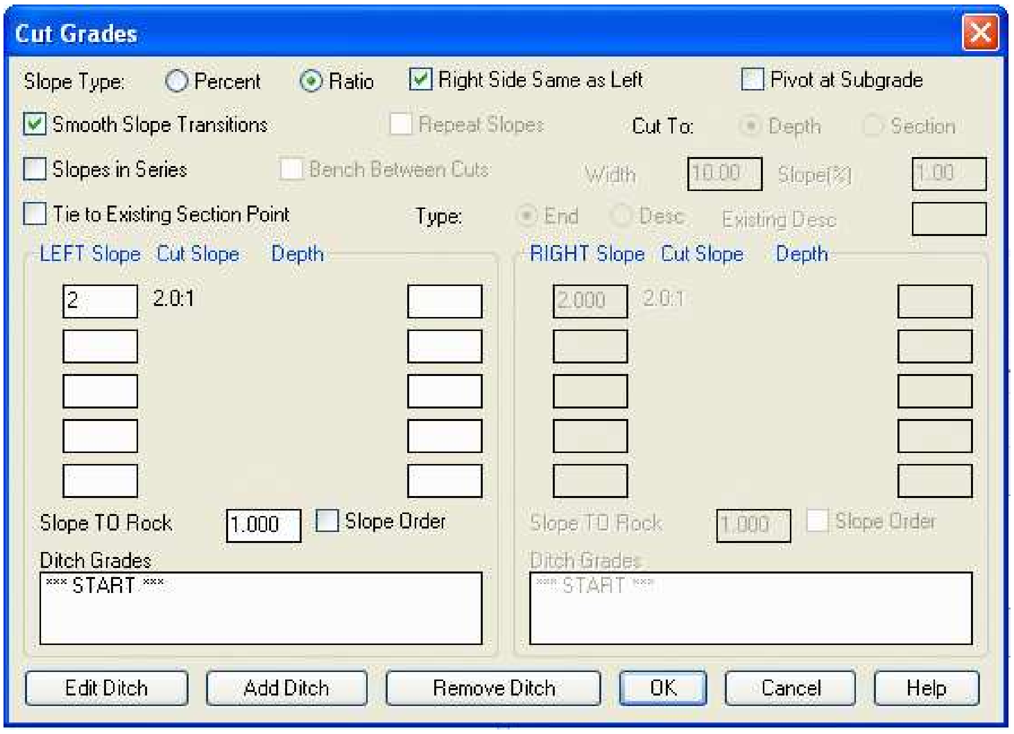
Max Depth 1.000 Min Depth 10.000

☐ At Base Of Fill SHD Extension 2.000

☐ Use Berm Minimum Depth 10.000

Berm Grades

*** START ***



Cut Grades

Slope Type: ○ Percent ● Ratio ☑ Right Side Same as Left ☐ Pivot at Subgrade

☑ Smooth Slope Transitions ☐ Repeat Slopes Cut To: ● Depth ○ Section

☐ Slopes in Series ☐ Bench Between Cuts Width 10.00 Slope(%) 1.00

☐ Tie to Existing Section Point Type: ● End ○ Desc Existing Desc

LEFT Slope Cut Slope Depth

2 2.0:1

Slope TO Rock 1.000 ☐ Slope Order

Ditch Grades

*** START ***

RIGHT Slope Cut Slope Depth

2.000 2.0:1

Slope TO Rock 1.000 ☐ Slope Order

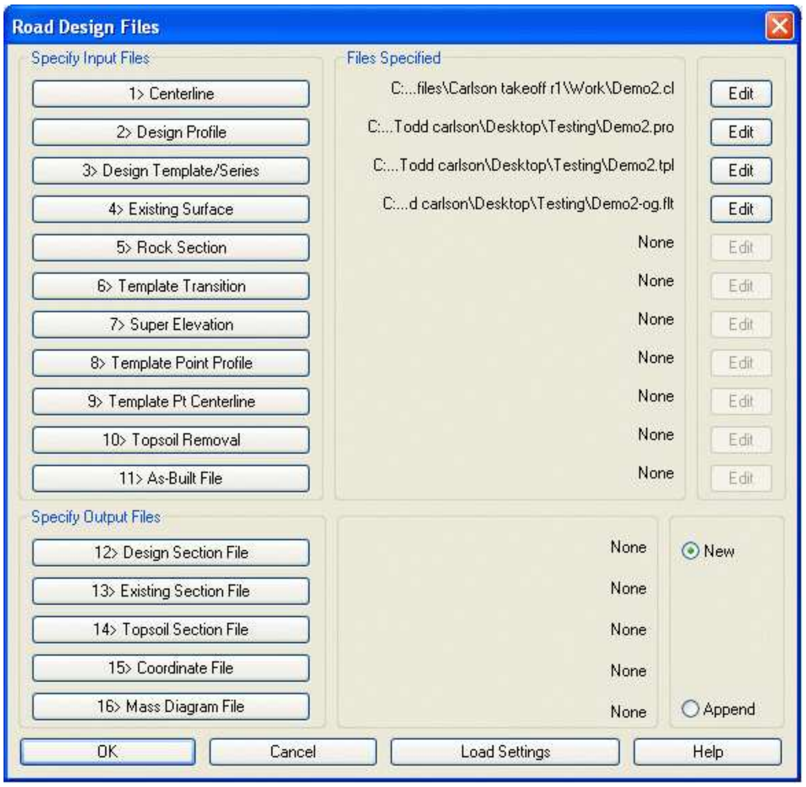
Ditch Grades

*** START ***

Now click Save. The template is complete.

Step 8 (Process Road Design):

This is the routine that weaves everything together. Select Process Road Design, the last command in the Roads menu. The Specify Input Files column on the left allows you to choose the files to be used in the road design. We have already created the four needed files, go ahead and select them now and then click OK.



Road Design Files

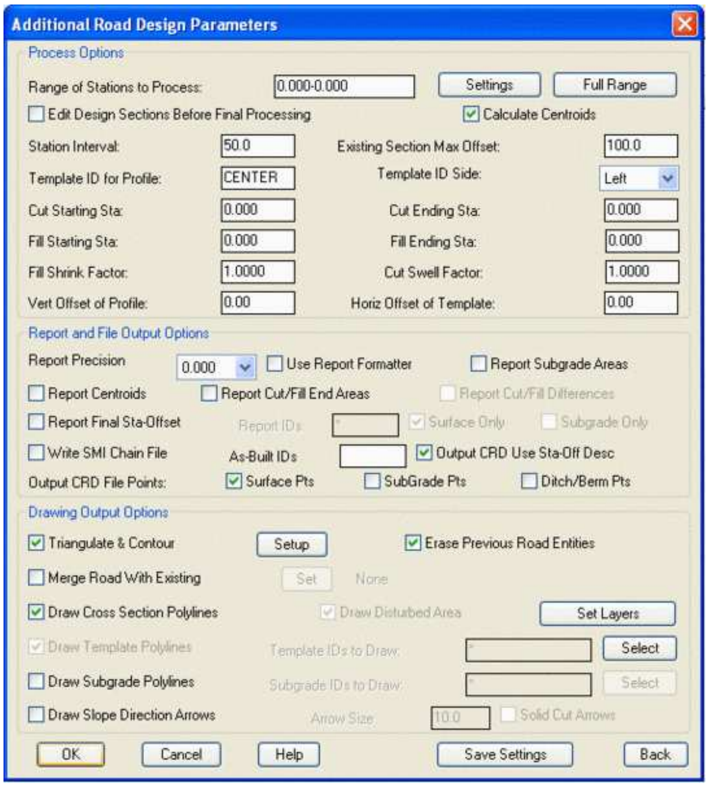
Specify Input Files

	Files Specified	
1> Centerline	C:...files\Carlson takeoff r1\Work\Demo2.cl	Edit
2> Design Profile	C:...Todd carlson\Desktop\Testing\Demo2.pro	Edit
3> Design Template/Series	C:...Todd carlson\Desktop\Testing\Demo2.tpl	Edit
4> Existing Surface	C:...d carlson\Desktop\Testing\Demo2-og.flt	Edit
5> Rock Section	None	Edit
6> Template Transition	None	Edit
7> Super Elevation	None	Edit
8> Template Point Profile	None	Edit
9> Template Pt Centerline	None	Edit
10> Topsoil Removal	None	Edit
11> As-Built File	None	Edit

Specify Output Files

12> Design Section File	None	● New
13> Existing Section File	None	
14> Topsoil Section File	None	
15> Coordinate File	None	
16> Mass Diagram File	None	○ Append

In the next dialog you can select different output features. For 3D viewing in the next step, toggle on Triangulate & Contour . It can be found in the bottom left portion of the Additional Earth Works Parameters dialog. Click OK. Note: To generate a plot of road sections, specify an output section file in the 1st Road Design dialog. Then run Draw Sections in the Roads menu.



Additional Road Design Parameters

Process Options

Range of Stations to Process: 0.000-0.000

☐ Edit Design Sections Before Final Processing

☑ Calculate Centroids

Station Interval:	50.0	Existing Section Max Offset:	100.0
Template ID for Profile:	CENTER	Template ID Side:	Left
Cut Starting Sta:	0.000	Cut Ending Sta:	0.000
Fill Starting Sta:	0.000	Fill Ending Sta:	0.000
Fill Shrink Factor:	1.0000	Cut Swell Factor:	1.0000
Vert Offset of Profile:	0.00	Horiz Offset of Template:	0.00

Report and File Output Options

Report Precision: 0.000

☐ Use Report Formatter

☐ Report Subgrade Areas

☐ Report Centroids

☐ Report Cut/Fill End Areas

☐ Report Cut/Fill Differences

☐ Report Final Sta-Offset

Report IDs: *

☑ Surface Only

☐ Subgrade Only

☐ Write SMI Chain File

As-Built IDs:

☑ Output CRD Use Sta-Off Desc

Output CRD File Points: ☑ Surface Pts ☐ SubGrade Pts ☐ Ditch/Berm Pts

Drawing Output Options

☑ Triangulate & Contour

☑ Erase Previous Road Entities

☐ Merge Road With Existing: None

☑ Draw Cross Section Polylines

☑ Draw Disturbed Area

☑ Draw Template Polylines

Template IDs to Draw: *

☐ Draw Subgrade Polylines

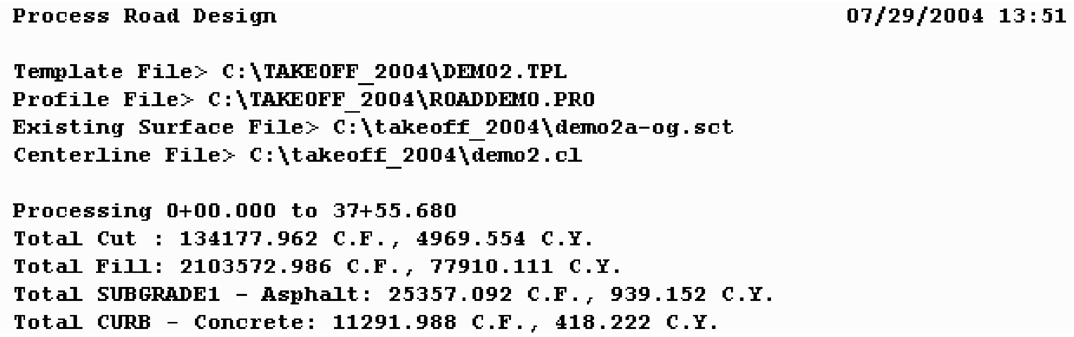
Subgrade IDs to Draw: *

☐ Draw Slope Direction Arrows

Arrow Size: 10.0

☐ Solid Cut Arrows

The following report listing the total Cut, Fill, Subgrade, and Curb volumes.



```
Process Road Design                                    07/29/2004 13:51

Template File> C:\TAKEOFF_2004\DEMO2.TPL
Profile File> C:\TAKEOFF_2004\ROADDEMO.PRO
Existing Surface File> C:\takeoff_2004\demo2a-og.sct
Centerline File> C:\takeoff_2004\demo2.cl

Processing 0+00.000 to 37+55.680
Total Cut : 134177.962 C.F., 4969.554 C.Y.
Total Fill: 2103572.986 C.F., 77910.111 C.Y.
Total SUBGRADE1 - Asphalt: 25357.092 C.F., 939.152 C.Y.
Total CURB - Concrete: 11291.988 C.F., 418.222 C.Y.
```

Trim existing contours inside disturbed area [Yes/<No>]? Press enter to say no

In the Contour Options dialog change the layer name to FINAL ROAD and make the contour interval 2. Click OK and your Road is complete! Here are the Road Design prompts:

Command: eworks

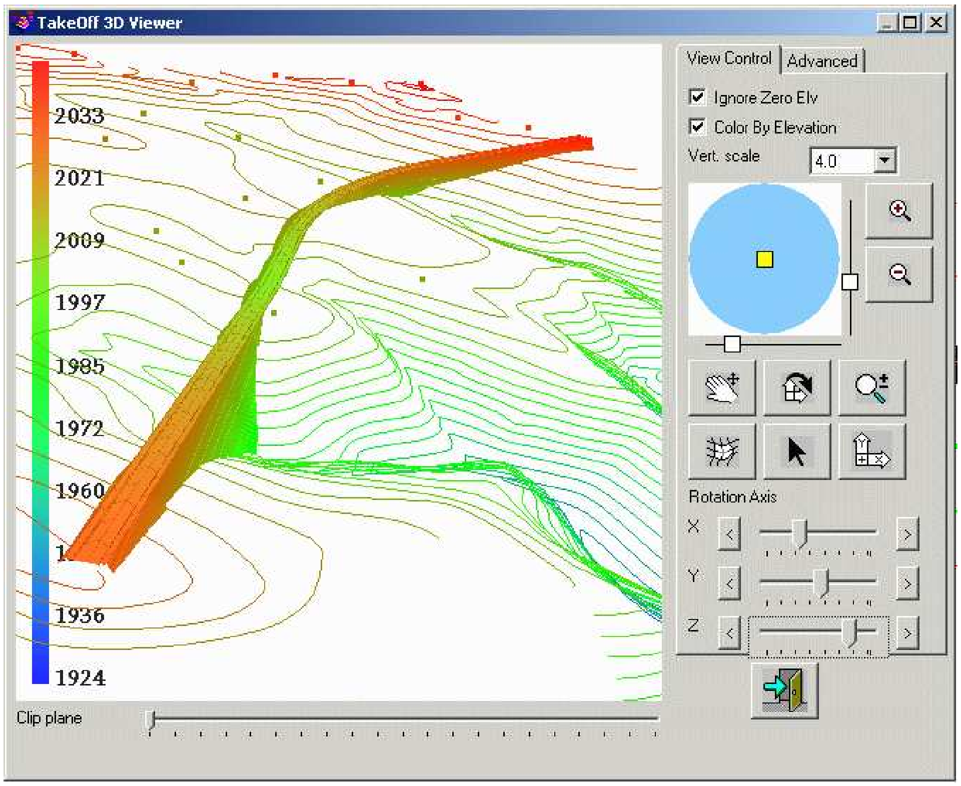
Initializing EarthWorks ...
Processing station: 3755.680
Drawing offset 3D polylines: TIE
Calculating volumes ...
Trim existing contours inside disturbed area [Yes/<No>]? <Enter>

Reading points... 2631
Inserted 2631 points
Inserted 2618 breakline segments

Drawing Triangulation 3D Faces ...
Contouring elevation 2040
Inserted 811 contour vertices.

Step 9 (3D Viewer):

Now that your Road is complete lets view it in 3D. Go to View, 3D Viewer Window, type in ALL, and press enter.


TakeOff 3D Viewer
2033
2021
2009
1997
1985
1972
1960
1
1936
1924
Clip plane
View Control
Advanced
Rotation Axis
X
Y
Z

☑ Ignore Zero Elv

☑ Color By Elevation

Vert. scale 4.0

Here is our road with a Vertical Scale of 4. Color By Elevation has also been toggled on. Use the X, Y, and Z control bars at the bottom to rotate the drawing in the 3D viewer.

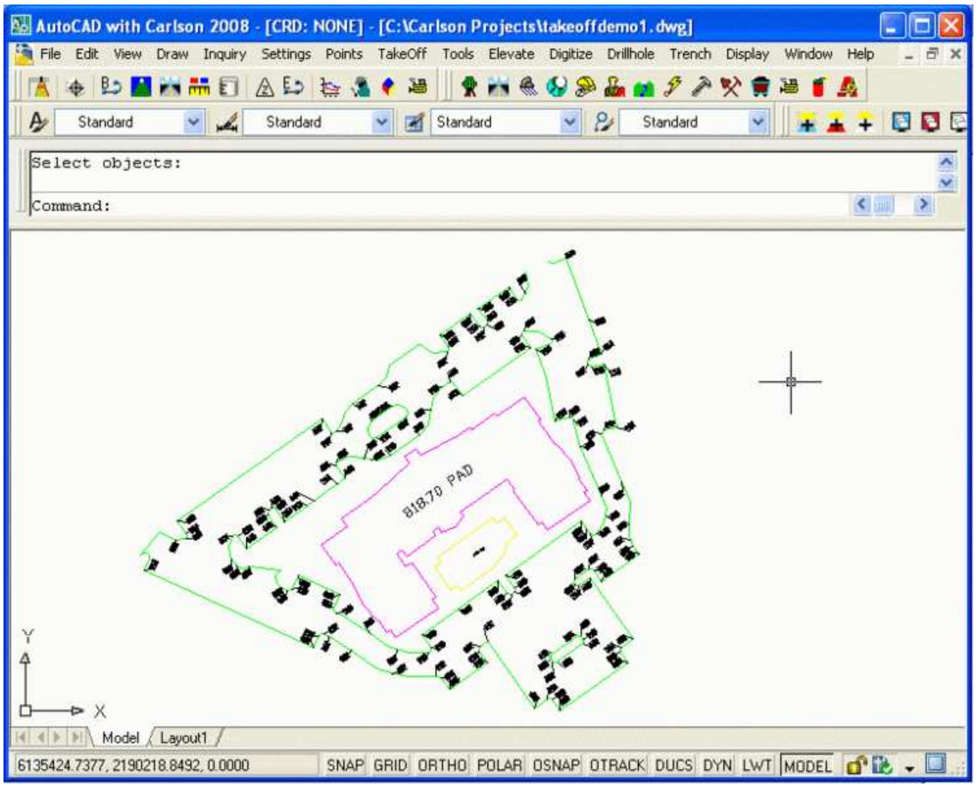
Takeoff Tutorial: Drillholes and Strata

This lesson creates and processes drillhole data.

Step 1 (Run Lesson 1 Example):

This drillhole lesson builds on the resulting drawing called takeoffdemo1.dwg from the tutorial lesson 10 (Takeoff Basics). Before continuing with this tutorial, run through and complete this lesson 1 tutorial.

When lesson 10 is done, let's set the display to show only the design entities. In the Display menu, turn off Existing Drawing and Other Drawing and turn on Design Drawing. Then run, View->Zoom->Extents. Now we're ready to add drillholes.

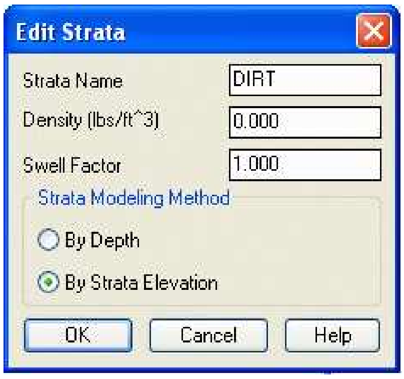

AutoCAD with Carlson 2008 - [CRD: NONE] - [C:\Carlson Projects\takeoffdemo1.dwg]
File Edit View Draw Inquiry Settings Points TakeOff Tools Elevate Digitize Drillhole Trench Display Window Help
Standard
Standard
Standard
Standard
818.70 PAD
Y
X
Model
Layout1
SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL

```
Select objects:
Command:
```

6135424.7377, 2190218.8492, 0.0000

Step 2 (Drillhole/Strata Settings):

From the File menu, choose Drillhole/Strata Settings. This command sets the drillhole symbol and the default strata names. For this tutorial, we are interested in rock quantities and we need to define two strata: Dirt (material above the rock) and Rock.


Edit Strata
OK
Cancel
Help

Strata Name: DIRT

Density (lbs/ft^3): 0.000

Swell Factor: 1.000

Strata Modeling Method

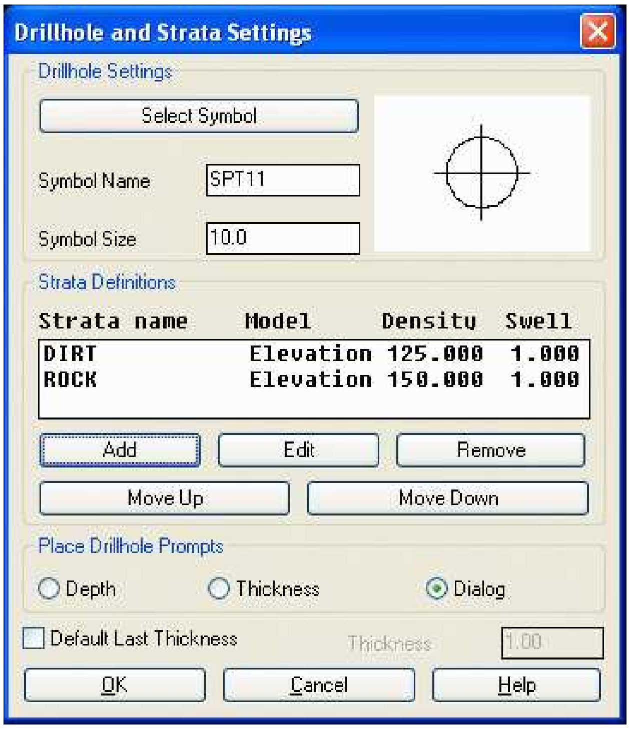
○ By Depth

● By Strata Elevation

Pick the Add button which brings up another dialog that defines a strata. Enter a strata name of "DIRT" and a density of 125 which will be used to calculate tons in the volume report. You can also have a strata specific cut swell factor. The strata can be modeled either by the elevations from the drillholes or by the depth from the existing ground. In this case, we will model by strata elevation. When the dialog is filled out as shown, pick OK.

Next, pick the Add button again. This time, fill out the dialog with a strata name of "ROCK" and density of 150. Then pick OK.

The Strata Definitions in the main dialog need to be in top to bottom order. To change the order, highlight a strata name and use the Move Up or Move Down buttons. In this case, we want Dirt then Rock. Click OK now from the main dialog.



Drillhole and Strata Settings

Drillhole Settings

Symbol Name SPT11

Symbol Size 10.0

Strata Definitions

Strata name	Model	Density	Swell
DIRT	Elevation	125.000	1.000
ROCK	Elevation	150.000	1.000

Place Drillhole Prompts

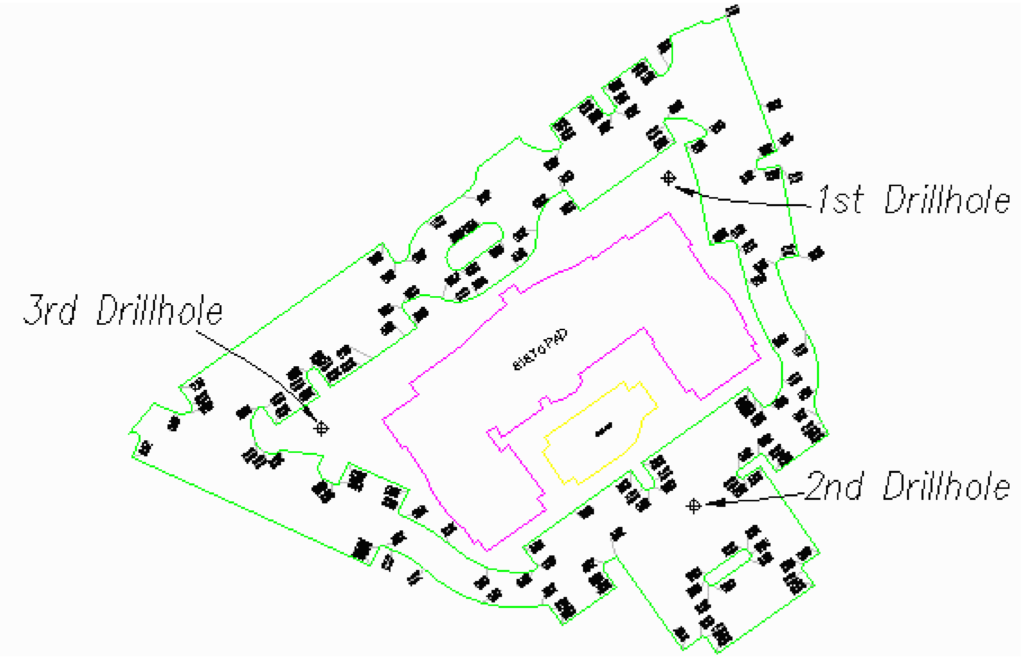
○ Depth ○ Thickness ● Dialog

☐ Default Last Thickness Thickness 1.00

Step 3 (Input Drillhole Data):

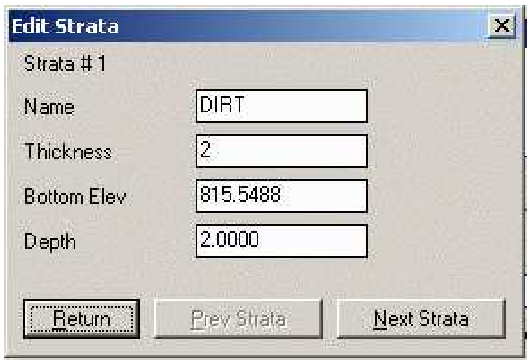
There are two different methods for entering drillhole data into Takeoff: Drillhole Import and Place Drillhole. Drillhole Import reads the drillhole data from a text file. This command supports customizing the sequence of drillhole data fields to match the format of the text file. Place Drillhole creates the drillholes at picked positions in the drawing and enters the data in a dialog. For this tutorial, we will use Place Drillhole.

Run the Drillhole->Place Drillhole command. At the command line, there is a prompt to pick the drillhole location. If you know the coordinates for the drillhole, you can type in the easting,northing instead of picking on the screen. In this case, let's pick a point above the upper right of the main building.
Pick Drillhole Location: *pick a point*



Then there is a dialog for entering the drillhole data. The surface elevation is automatically filled in using the existing ground surface model. The Drillhole Name and Description are optional. The list of strata defaults to the strata defined in Drillhole/Strata Settings. Each strata defaults to a thickness of zero. To set the strata thickness, highlight the strata and pick the Edit button.

For this case, highlight Dirt and pick Edit. This brings up the Edit Strata dialog. The strata position can be defined by thickness, elevation or depth. Setting any one of these fields will update the other fields. For our dirt strata, fill in a thickness of 2 and then pick OK.

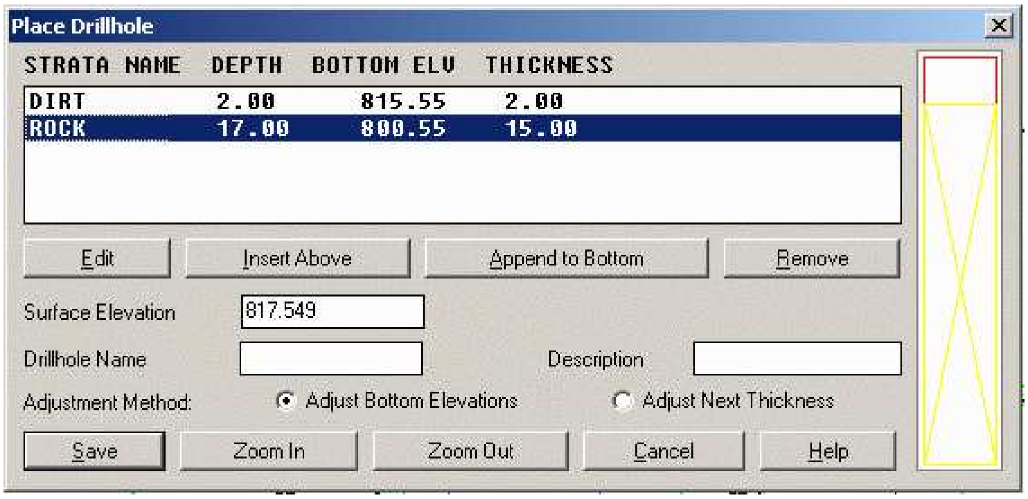


Strata # 1

Name	DIRT
Thickness	2
Bottom Elev	815.5488
Depth	2.0000

Next, pick Rock from the strata list and pick Edit. For this example, we only know the depth to the top of rock depth and not the total rock thickness. We will treat all cut below the top of rock as rock strata. So we will set the rock thickness deep enough to be lower than the deepest cut on site. In this case, we will use a rock thickness of 15. So in the Edit Strata dialog for rock, enter a thickness of 15 and then pick OK.

After editing the rock strata, we are returned to the main Edit Drillhole dialog. Pick the Save button.

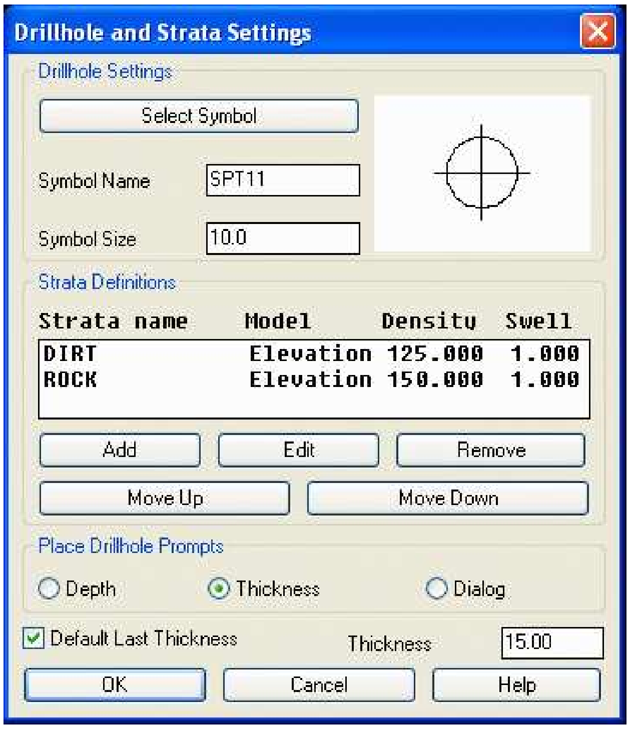


STRATA NAME	DEPTH	BOTTOM ELV	THICKNESS
DIRT	2.00	815.55	2.00
ROCK	17.00	800.55	15.00

Surface Elevation	817.549
Drillhole Name	
Description	

Adjustment Method: ● Adjust Bottom Elevations ○ Adjust Next Thickness

Now let's locate two more drillholes using a different method. Return Drillhole/Strata Settings dialog and change Place Drillhole Prompts to Thickness. Also, check on Default Thickness and set it to 15 feet, Press OK.



Symbol Name: SPT11
Symbol Size: 10.0

Strata name	Model	Density	Swell
DIRT	Elevation	125.000	1.000
ROCK	Elevation	150.000	1.000

○ Depth ● Thickness ○ Dialog

☑ Default Last Thickness

Thickness: 15.00

Now run Place Drillhole again and for the second drillhole, pick a position in the lower parking lot. The command line will prompt you to enter a dirt thickness, type in 1.5 and your drillhole is created. For the third drillhole, pick a position left of the main building. Enter a dirt thickness of 3.0, save, and enter to end the command.

Step 4 (Make Strata Surfaces):

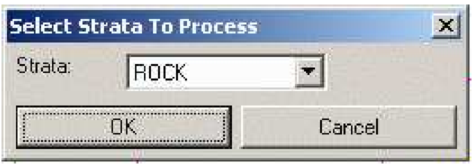
Now that the drillholes are in the drawing, to make the strata triangulation surfaces, run the Drillhole->Make Strata Surfaces command. There are no prompts for this routine. The strata surfaces are modeled from the drillholes and saved with the project. The file names for the strata surfaces use the drawing name plus "-ch#" where the # is the strata sequence number. For this example, the file names will be "takeoffdemo1-ch1" for bottom of dirt and "takeoffdemo1-ch2" for bottom of rock.

Now that the strata surfaces are created, there are several Takeoff routines that will use these surfaces such as:
- Calculate Total Volumes
- Calculate Volumes Inside Perimeter
- Cut/Fill Labels
- Surface Inspector
- Quick Profile
- Trench Network Quantities

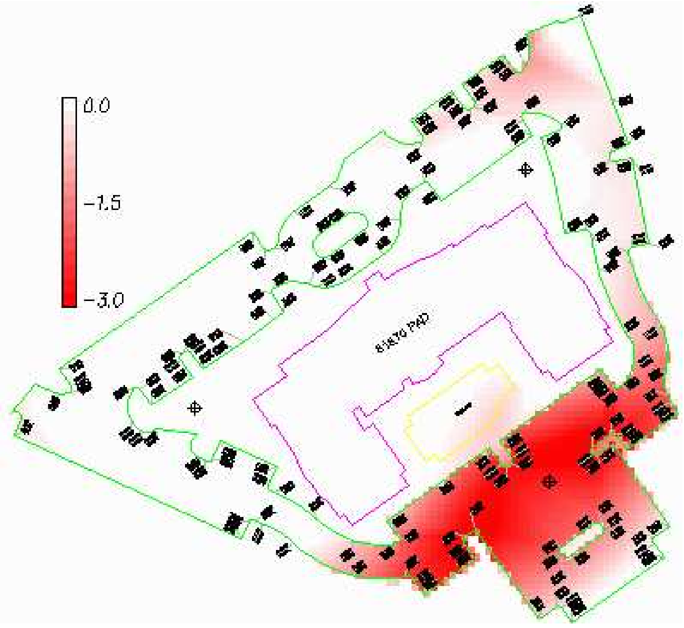
Step 5 (Draw Strata Cut Color Map):

From the Drillhole menu, pick Draw Strata Cut Color Map. This command compares the design surface with the strata surface to make a cut color map of the cut depths for the strata. This command is one way to verify that the strata surfaces are modeled correctly.

There is a dialog to select which strata map to draw. Choose Rock and pick OK. Then there is an option to draw a cut depth legend. Pick a position for the legend in the upper left of the site and use the defaults for size and zone summary.

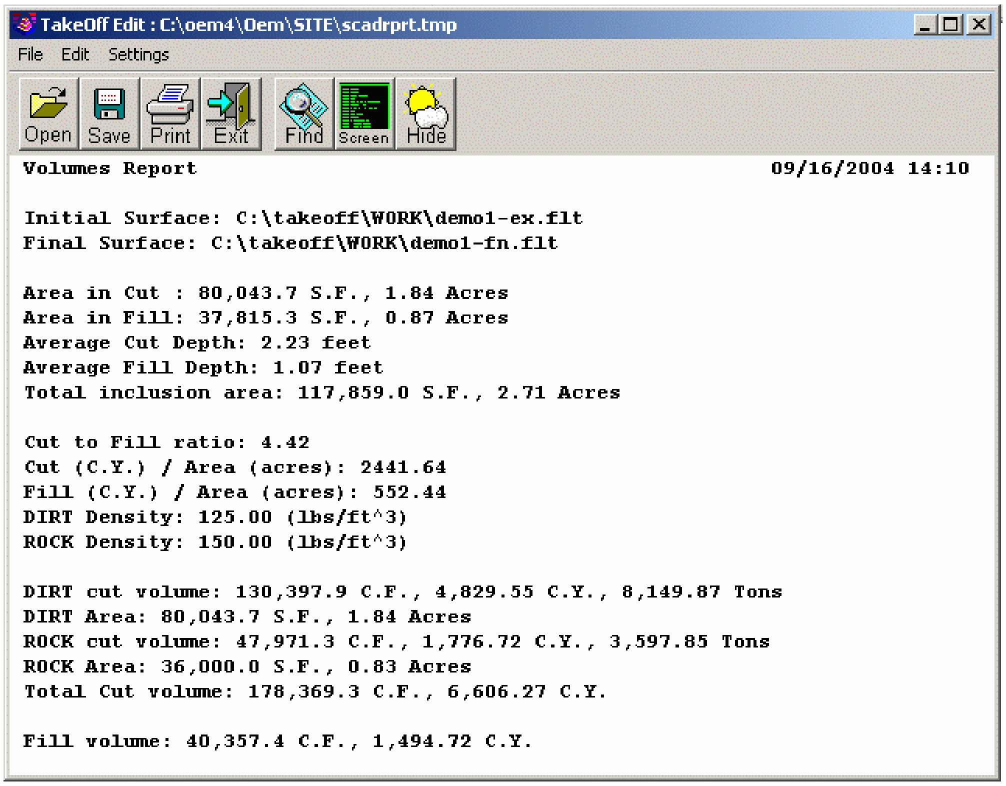

Select Strata To Process
OK
Cancel

Strata: ROCK



Step 6 (Calculate Total Volumes):

Run the Takeoff->Calculate Total Volumes command. When strata surfaces are defined, the volume routine will breakout the cut volume into the different strata. The resulting dirt and rock quantities are shown in the report.


TakeOff Edit : C:\oem4\Oem\SITE\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Volumes Report                                              09/16/2004 14:10

Initial Surface: C:\takeoff\WORK\demo1-ex.flt
Final Surface: C:\takeoff\WORK\demo1-fn.flt

Area in Cut : 80,043.7 S.F., 1.84 Acres
Area in Fill: 37,815.3 S.F., 0.87 Acres
Average Cut Depth: 2.23 feet
Average Fill Depth: 1.07 feet
Total inclusion area: 117,859.0 S.F., 2.71 Acres

Cut to Fill ratio: 4.42
Cut (C.Y.) / Area (acres): 2441.64
Fill (C.Y.) / Area (acres): 552.44
DIRT Density: 125.00 (lbs/ft^3)
ROCK Density: 150.00 (lbs/ft^3)

DIRT cut volume: 130,397.9 C.F., 4,829.55 C.Y., 8,149.87 Tons
DIRT Area: 80,043.7 S.F., 1.84 Acres
ROCK cut volume: 47,971.3 C.F., 1,776.72 C.Y., 3,597.85 Tons
ROCK Area: 36,000.0 S.F., 0.83 Acres
Total Cut volume: 178,369.3 C.F., 6,606.27 C.Y.

Fill volume: 40,357.4 C.F., 1,494.72 C.Y.
```

Takeoff Tutorial: Trench Network Quantities

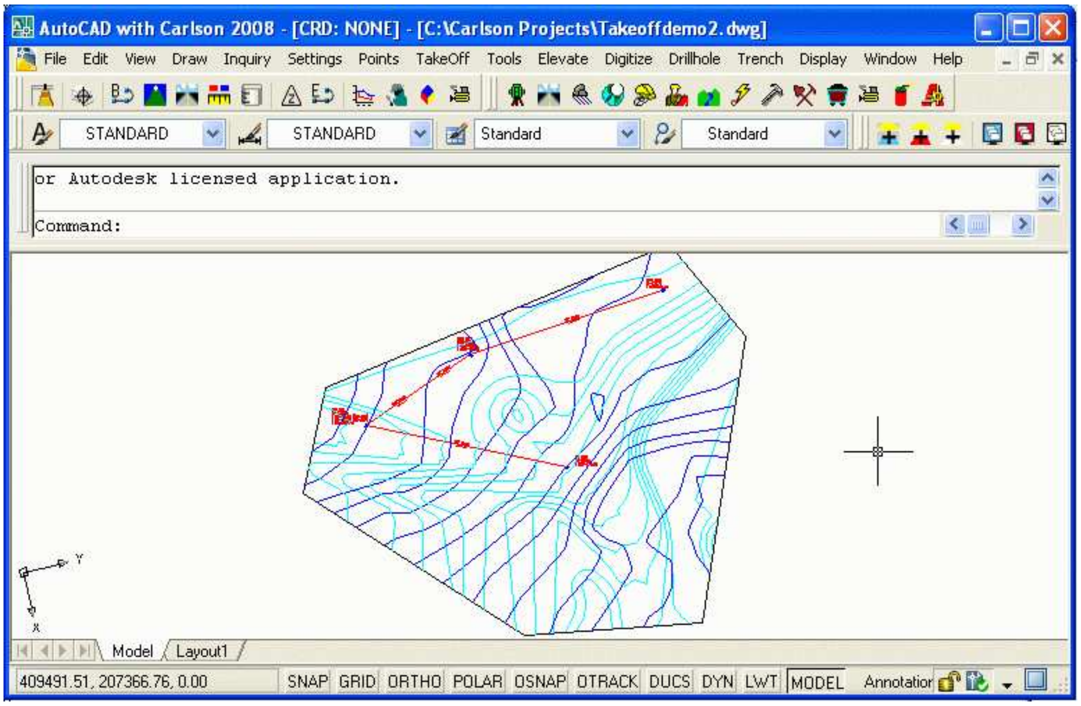
This lesson takes a drawing file through the steps of trench network quantities.

Step 1 (Start Takeoff):

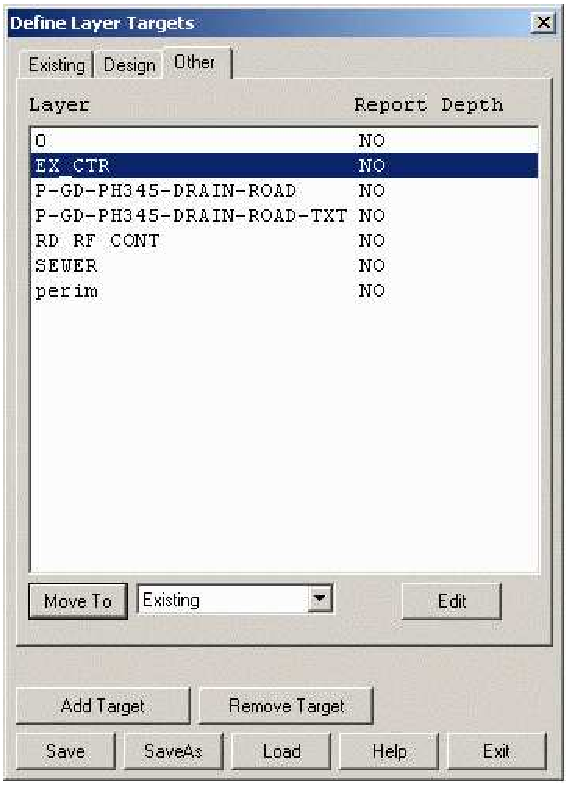
Click the icon for Takeoff on your desktop or from the toolbar to launch the program. You may be presented with a "Startup Wizard" dialog and if so, click Exit.

Step 2 (Open Drawing):

From the File menu, choose Open and select Takeoffdemo2.dwg from the Carlson Projects folder.


AutoCAD with Carlson 2008 - [CRD: NONE] - [C:\Carlson Projects\Takeoffdemo2.dwg]
File Edit View Draw Inquiry Settings Points TakeOff Tools Elevate Digitize Drillhole Trench Display Window Help
STANDARD
STANDARD
Standard
Standard
Model
Layout1
409491.51, 207366.76, 0.00
SNAP GRID ORTHO POLAR OSNAP OTRACK DUCS DYN LWT MODEL
Annotation

```
or Autodesk licensed application.

Command:
```



Layer	Report Depth
0	NO
EX CTR	NO
P-GD-PH345-DRAIN-ROAD	NO
P-GD-PH345-DRAIN-ROAD-TXT	NO
RD RF CONT	NO
SEWER	NO
perim	NO

Step 3 (Make Existing and Design Surfaces):

In order to calculate trench quantities and profiles in this drawing, we need surfaces for the existing ground and design.

First we need to define the layers of the surfaces. Run TakeOff->Define Layer Target/Material/Subgrade. Then from the tab labeled "Other", highlight "EX_CTR" from the layer list, pick "Existing" from the Move To list and pick the Move To button. Next, highlight "RD RF CONT", choose "Design" from the Move To list and pick the Move To button. Now choose the Save and then Exit buttons. This assigned layer "EX_CTR" to the existing ground surface and "RD RF CONT" to the design surface.

Next, let's set the site perimeter. Run TakeOff->Boundary Polyline->Set Boundary Polyline. At the command line, there is a prompt:
Select boundary polyline:
Pick anywhere along the six sided perimeter polyline in the drawing.

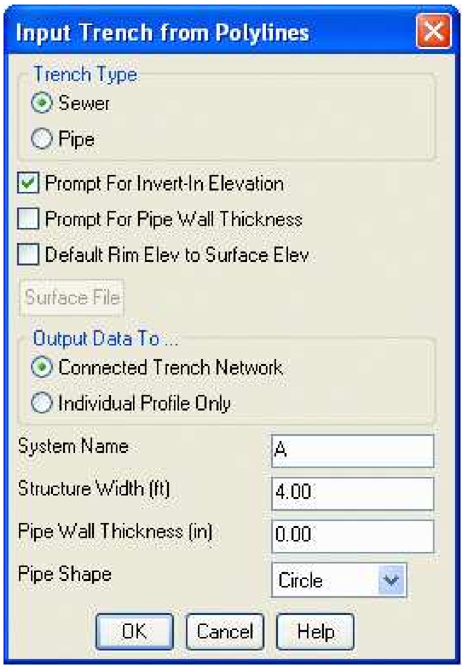
Now, to make the existing ground surface, run TakeOff->Make Existing Ground Surface. Then to make the design surface, run TakeOff->Make Design Surface.

Step 4 (Input Trench Network Data):

The trench network data consists of linked structures where each structure has a name, location (x,y), invert-in, invert-out and rim elevation. Each structure link has a pipe size. There are two ways of entering the trench data. When the drawing contains polylines for the trench lines and labels with the trench data, then you can use Input Trench From Polyline. Otherwise, there is the Create Trench Network Structure command which let's you pick the structure locations and enter the data in a dialog.

Method 1 (Input Trench Data From Polyline):
In this example, there is trench data already drawn in the drawing. Zoom in around the upper right area of trench line by running View->Zoom->Window and picking two corner points around this area.

Then run Trench->Input Trench From Polyline and an options dialog appears. In this case, we want Trench Type as Sewer because there are manhole rim elevations. Also Prompt For Invert-In Elevations is active since this example has a manhole with multiple connections with different invert-ins. And Connected Network is used so that the trench data can be used by the rest of the trench routines. The Individual Profile option will only create a profile (.pro) file. Prompt For Pipe Wall Thickness allows you to enter in the pipe thickness that will be added to the interior pipe size for accurate volume calculations. Fill out the dialog as shown and click OK.


Input Trench from Polylines

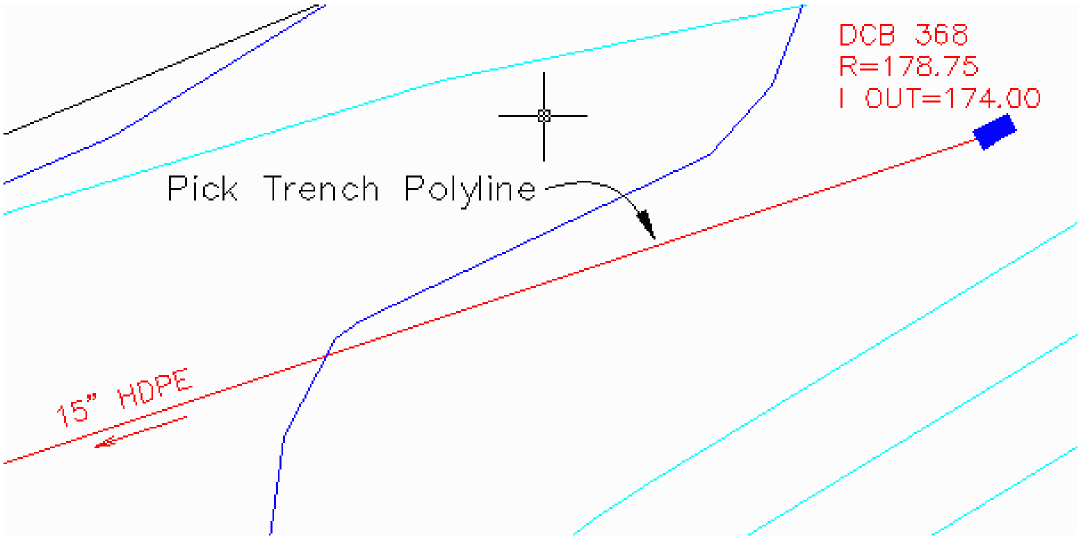
Trench Type
● Sewer
○ Pipe

☑ Prompt For Invert-In Elevation
☐ Prompt For Pipe Wall Thickness
☐ Default Rim Elev to Surface Elev

Output Data To ...
● Connected Trench Network
○ Individual Profile Only

System Name: A
Structure Width (ft): 4.00
Pipe Wall Thickness (in): 0.00
Pipe Shape: Circle

The rest of the prompting for this command is on the command line as the program walks through the trench line. For each point in the trench polyline, the program zooms the drawing to that point. The trench data can be picked from labels in the drawing. If the drawing doesn't have labels for the data, then you can enter the values.

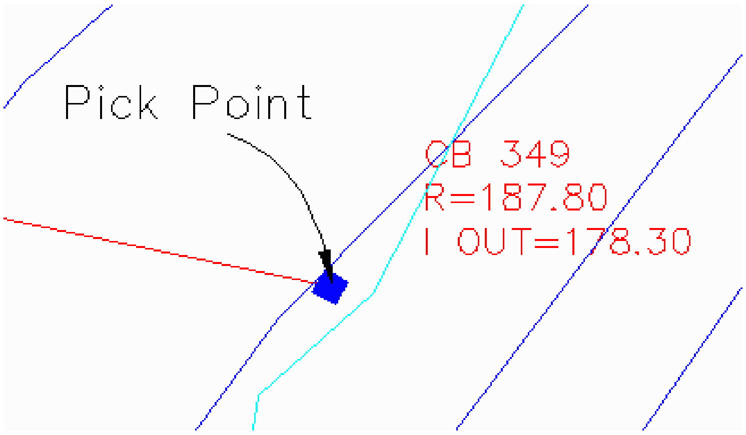


Pick a polyline that represents a trench reach: *Pick the trench polyline*
Starting Station of trench reach <0.0>: *0.0*
For station 0.00 ...
Enter/<Select text of Manhole ID>: *Pick the DCB 368 label.* (If you had a drawing without a manhole ID label, then type E for Enter and enter the ID)
ID: DCB 368

Undo/Enter/<Select text of Invert-in elevation>: *Pick the I Out=174 label.* (Since this is the upstream starting manhole, there really isn't a separate invert-in. So we are using the invert-out).
Invert-In: 174.000
Undo/Enter/<Select text of Invert-out elevation>: *Pick the I Out=174 label.*
Invert-Out: 174.000
Undo/Enter/<Select text of manhole rim elevation>: *Pick the R=178.75 label.*
Rim: 178.750
For station 201.44 ...
Enter/<Select text of Manhole ID>: *Pick the DCB 367 label.*
ID: DCB 367
Undo/Enter/<Select text of Invert-in elevation>: *Pick the I In=172.85 label.*
Invert-In: 172.850
Undo/Enter/<Select text of Invert-out elevation>: *Pick the I Out=172.35 label.*
Invert-Out: 172.350
Undo/Enter/<Select text of manhole rim elevation>: *Pick the R=178.5 label.*
Rim: 178.500
Undo/Enter/<Select text of pipe size>: *Pick the 15" HDPE label.*
Pipe Size: 15.0
For station 327.09 ...
Enter/<Select text of Manhole ID>: *Pick the CB 347 label.*
ID: CB 347
Undo/Enter/<Select text of Invert-in elevation>: *Pick the I In=170.540 (CB 367) label.* (This is the invert-in for the connection to the CB 367 structure that this trench line connects to.)
Invert-In: 170.540
Undo/Enter/<Select text of Invert-out elevation>: *Pick the I Out=166.1 label.*
Invert-Out: 166.100
Undo/Enter/<Select text of manhole rim elevation>: *Pick the R=176.5 label.*
Rim: 176.500
Undo/Enter/<Select text of pipe size>: *Pick the 15" HDPE label.*
Pipe Size: 15.0
Another Polyline [<Yes>/No]? *N* for no.

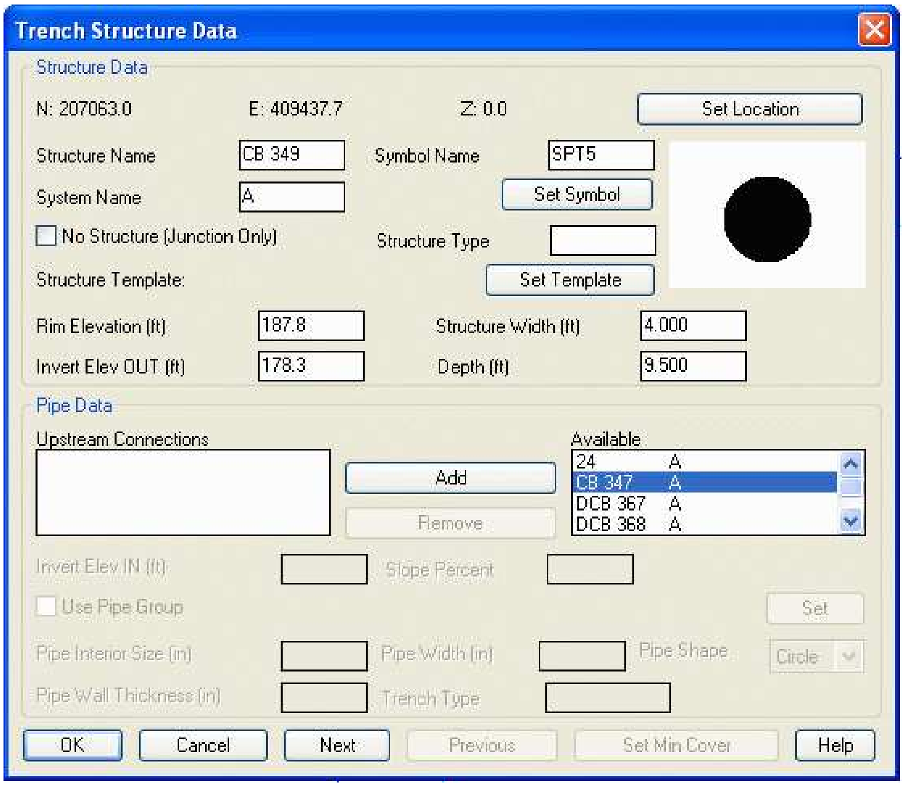
That completes this trench run and Takeoff draws its own trench polyline and labels.

Method 2 (Create Trench Network Structure):
The drawing contains another trench polyline and we could use Input Trench Data From Polyline again. Instead for practice, let's use the Create Trench Network Structure method. First we need to zoom to the new trench location. Run View->Zoom->Extents and then View->Zoom->Window and pick two points for a window around the lower right trench point (CB 349). Then run Trench->Create Trench Network Structure. At the command line, there is a prompt for how to locate the structure position. Choose Pick.
Locate by pick point, point number or station-offset [<Pick>/Number/CL]? *Pick*



Next, there is a prompt to pick the position. To get the exact end point of the trench polyline, use the end point snap. The end point snap can be turned on by a number of different ways including the Settings->Object Snap command. In this case, type "end" and then space or enter. This puts the program in end point snap mode. Now move the pointer along the trench polyline until the end point snap icon is at the manhole location and then pick.
Pick structure location: *end of (pick point)*

Now a dialog appears for entering the structure data. Fill in the Structure Name as CB 349, the Rim Elevation as 187.8, the Invert-Out as 178.3, the Structure Width as 4.00 and then pick OK.



Trench Structure Data

Structure Data

N: 207063.0 E: 409437.7 Z: 0.0

Structure Name: CB 349

Symbol Name: SPT5

System Name: A

☐ No Structure (Junction Only)

Structure Type:

Structure Template:

Rim Elevation (ft): 187.8

Structure Width (ft): 4.000

Invert Elev OUT (ft): 178.3

Depth (ft): 9.500

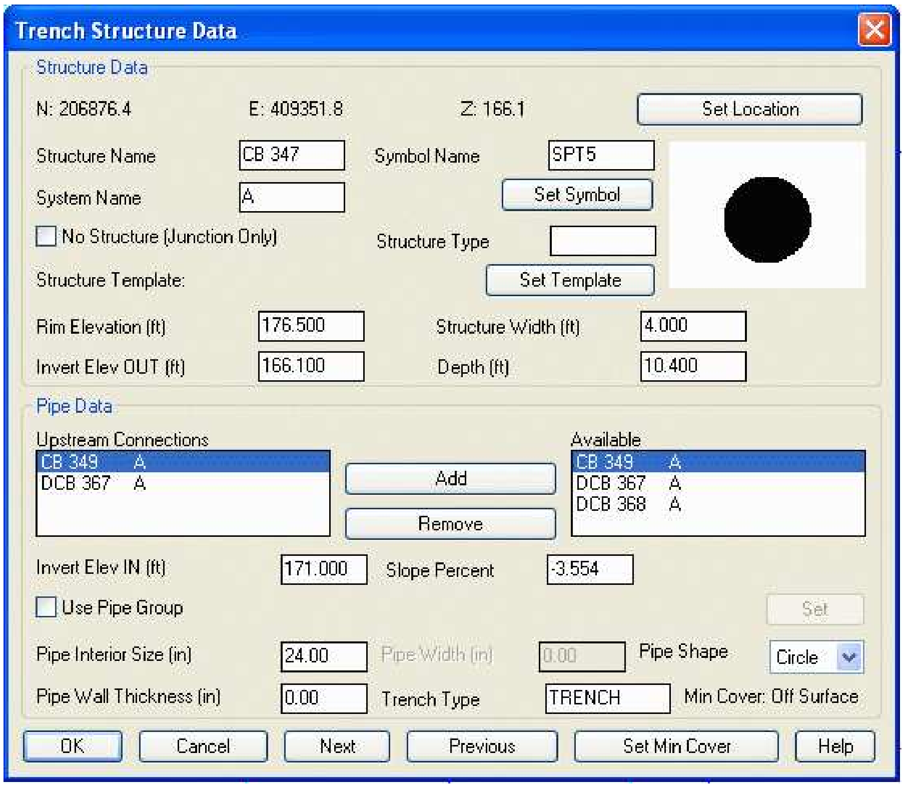
Pipe Data

Upstream Connections

Available:
24 A
CB 347 A
DCB 367 A
DCB 368 A

Set Location
Set Symbol
Set Template
Add
Remove
Invert Elev IN (ft)
Slope Percent
Use Pipe Group
Set
Pipe Interior Size (in)
Pipe Width (in)
Pipe Shape
Circle
Pipe Wall Thickness (in)
Trench Type
OK
Cancel
Next
Previous
Set Min Cover
Help

All the structures are now created. The last step is to link this new structure to the network. We need to zoom to the next trench location. Run View->Zoom->Extents and then View->Zoom->Window and pick two points for a window around the left trench point (CB 347). Now run Trench->Edit Trench Network Structure and pick either the symbol for CB 347 or the label. Then a dialog appears with the data for CB 347. From the Available list, highlight CB 349 and pick Add. This creates a link from CB 347 to CB 349 and the link data is shown at the bottom of the dialog. Enter the Invert-In as 171 and the Pipe Size as 24. Then pick OK.



N: 206876.4 E: 409351.8 Z: 166.1

Structure Name: CB 347

Symbol Name: SPT5

System Name: A

☐ No Structure (Junction Only)

Structure Type:

Structure Template:

Rim Elevation (ft): 176.500

Structure Width (ft): 4.000

Invert Elev OUT (ft): 166.100

Depth (ft): 10.400

Upstream Connections	Available
CB 349 A	CB 349 A
DCB 367 A	DCB 367 A
	DCB 368 A

Invert Elev IN (ft): 171.000

Slope Percent: -3.554

☐ Use Pipe Group

Pipe Interior Size (in): 24.00

Pipe Width (in): 0.00

Pipe Shape: Circle

Pipe Wall Thickness (in): 0.00

Trench Type: TRENCH

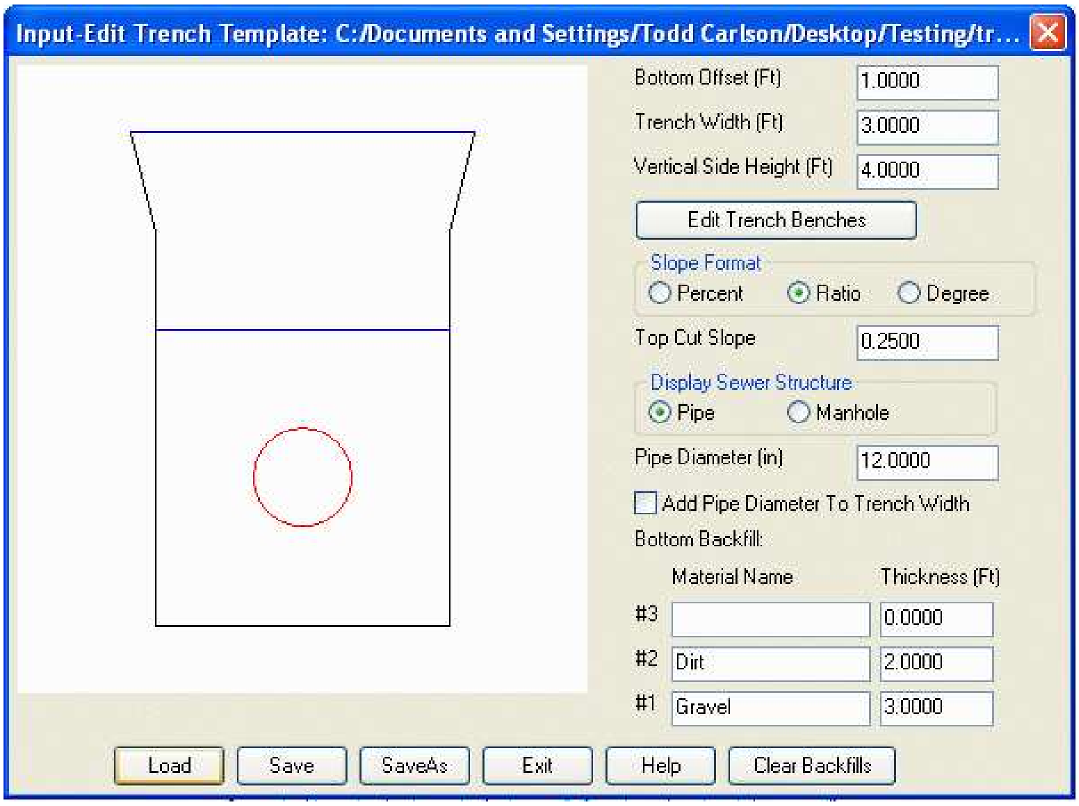
Min Cover: Off Surface

Step 5 (Input-Edit Trench Template):

The Trench Template defines the size of the trench for quantities. Run Trench->Input-Edit Trench Template. You are first prompted for a trench template file name. The Trench Template data is stored in a file that has a .tch extension. Choose the New tab, enter a file name like trench1 and then pick Open.

Next, there is a dialog for entering the trench dimensions. The Bottom Offset is the distance from the bottom of the pipe to the bottom of the trench. The Trench Width is the base width of the trench. The Vertical Side Height is the height from the bottom that the side walls are vertical until switching to the cut slope. If the surface is not reached by the vertical side height, then the cut slope is used for the rest of the distance to the surface. Edit Trench Benches allows you to set up to four benches in your trench. Display Sewer Structure allows you to see your pipe or manhole as part of the trench. Note: This is for display purposes only, calculations will be drawn from the pipe size you set in the Trench Network Structure commands. Add Pipe Diameter To Trench Width will increase the size of your trench by the diameter of your different pipe sizes. The Cut Slope can be entered in slope percent, ratio or degree format. The Backfill materials are optional. Up to three materials can be entered from the bottom.

Fill out the dialog as shown and pick Save and Exit.



Input-Edit Trench Template: C:/Documents and Settings/Todd Carlson/Desktop/Testing/tr...

Bottom Offset (Ft) 1.0000
Trench Width (Ft) 3.0000
Vertical Side Height (Ft) 4.0000

Slope Format: ○ Percent ● Ratio ○ Degree

Top Cut Slope 0.2500

Display Sewer Structure: ● Pipe ○ Manhole

Pipe Diameter (in) 12.0000

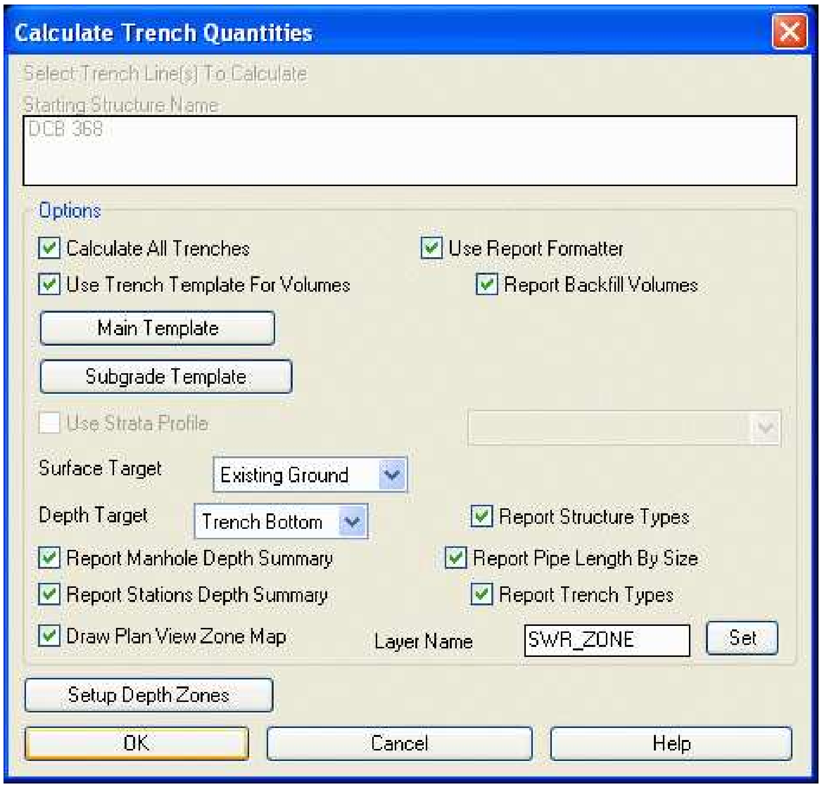
☐ Add Pipe Diameter To Trench Width

Bottom Backfill:

	Material Name	Thickness (Ft)
#3		0.0000
#2	Dirt	2.0000
#1	Gravel	3.0000

Step 6 (Trench Network Quantities):

To calculate and report the trench quantities, run Trench->Trench Network Quantities. A dialog sets the report options. Check on Calculate All Trenches to get the quantities for the whole network. To get the trench cut volume, check Use Trench Template For Quantities and pick Set Trench Template and pick trench1.tch. Also turn on Report Backfill Volumes to use our backfill material settings from the trench template. Finally, fill out the depth zones in the intervals that you are interested in. In this case, use 15, 20 and 25. The depth zones will be colored in the plain view. Once the dialog is filled out as shown, pick Setup Depth Zones.



Calculate Trench Quantities

Select Trench Line(s) To Calculate

Starting Structure Name: DCB 368

Options

☑ Calculate All Trenches

☑ Use Report Formatter

☑ Use Trench Template For Volumes

☑ Report Backfill Volumes

☐ Use Strata Profile

Surface Target: Existing Ground

Depth Target: Trench Bottom

☑ Report Structure Types

☑ Report Manhole Depth Summary

☑ Report Pipe Length By Size

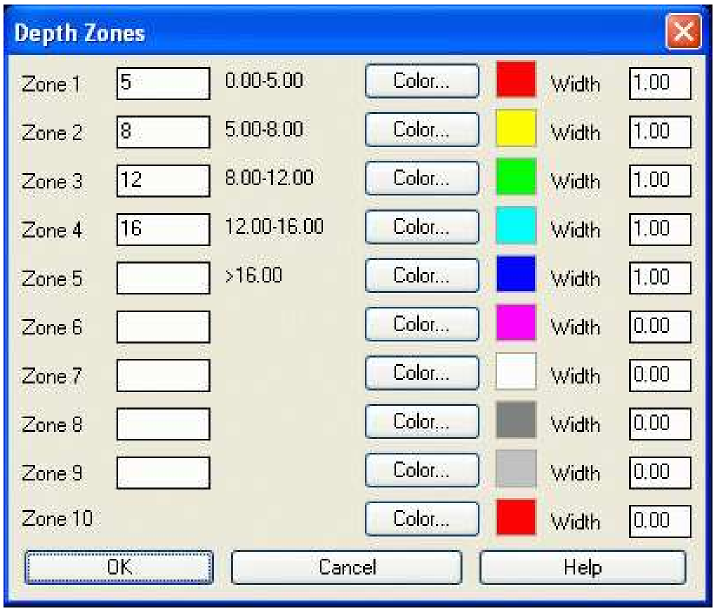
☑ Report Stations Depth Summary

☑ Report Trench Types

☑ Draw Plan View Zone Map

Layer Name: SWR_ZONE

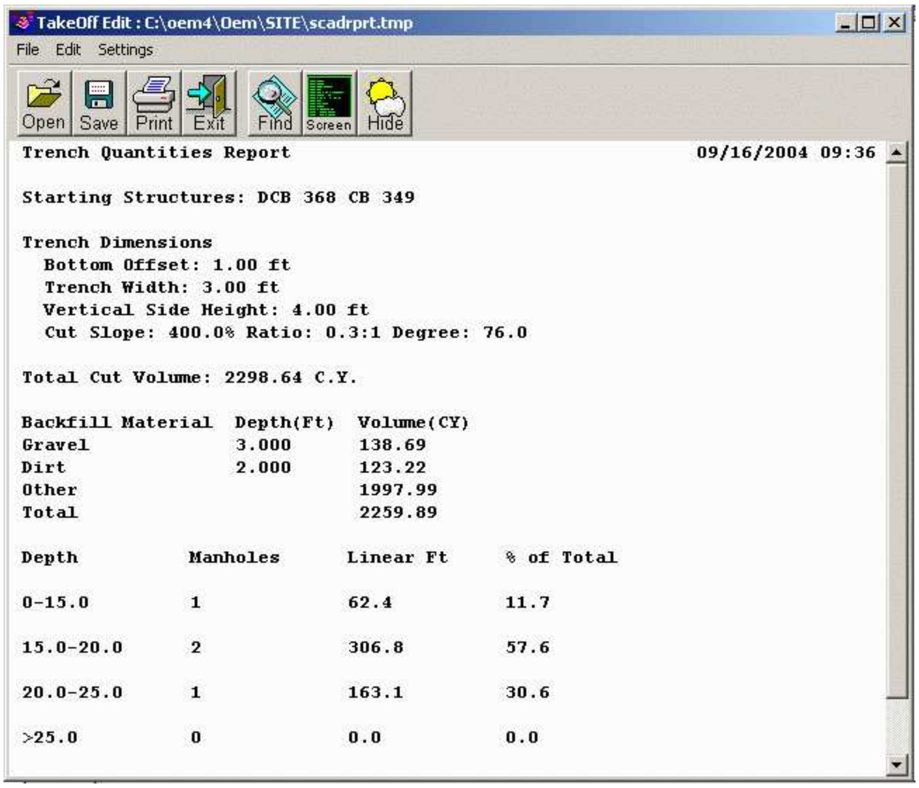
Fill out the depth zones in the intervals that you are interested in. In this case, use 15, 20 and 25. The depth zones will be colored in the plain view. Finally, click OK and OK in the main dialog and the report is shown.



Depth Zones

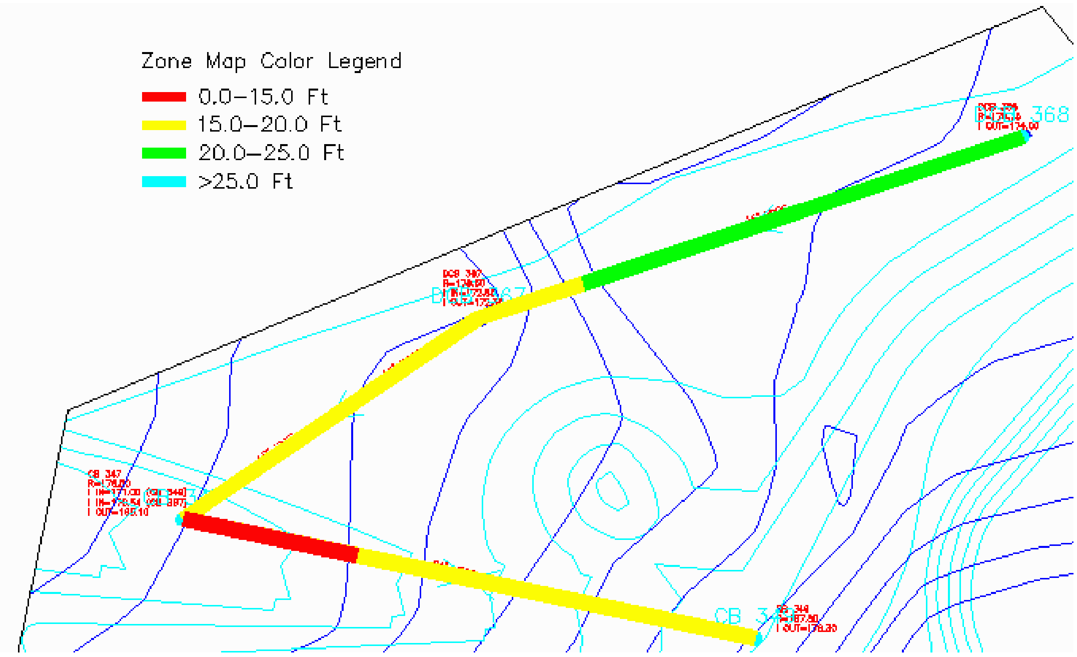
Zone 1	5	0.00-5.00	Color...	🟥	Width	1.00
Zone 2	8	5.00-8.00	Color...	🟨	Width	1.00
Zone 3	12	8.00-12.00	Color...	🟩	Width	1.00
Zone 4	16	12.00-16.00	Color...	▨	Width	1.00
Zone 5		>16.00	Color...	🟦	Width	1.00
Zone 6			Color...	🟪	Width	0.00
Zone 7			Color...	⬜	Width	0.00
Zone 8			Color...	⬛	Width	0.00
Zone 9			Color...	▩	Width	0.00
Zone 10			Color...	🟥	Width	0.00

The report includes:
- The structure names at the start of each trench run included in the report.
- The trench template dimensions.
- The cut volume.
- The backfill volumes.
- The number of manholes and length of trench within each depth zone.


TakeOff Edit : C:\oem4\Oem\SITE\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

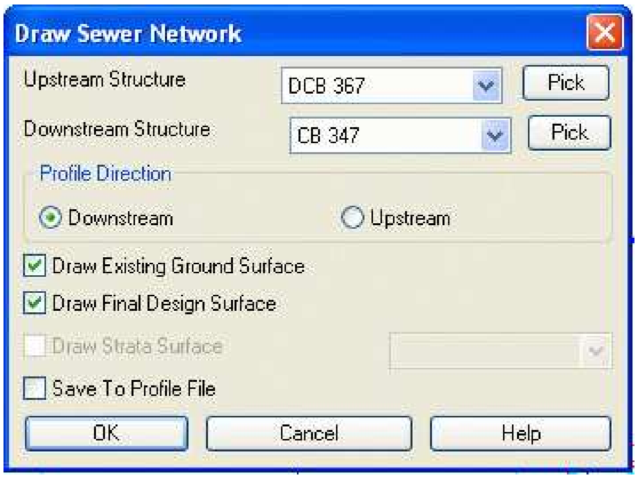
```
Trench Quantities Report                                   09/16/2004 09:36

Starting Structures: DCB 368 CB 349

Trench Dimensions
  Bottom Offset: 1.00 ft
  Trench Width: 3.00 ft
  Vertical Side Height: 4.00 ft
  Cut Slope: 400.0% Ratio: 0.3:1 Degree: 76.0

Total Cut Volume: 2298.64 C.Y.

Backfill Material  Depth(Ft)  Volume(CY)
Gravel             3.000      138.69
Dirt               2.000      123.22
Other                         1997.99
Total                         2259.89

Depth          Manholes      Linear Ft      % of Total

0-15.0         1             62.4           11.7

15.0-20.0      2             306.8          57.6

20.0-25.0      1             163.1          30.6

>25.0          0             0.0            0.0
```

The depth zones in the plain view with Zone Map Color Legend.


Zone Map Color Legend
🟥 0.0-15.0 Ft
🟨 15.0-20.0 Ft
🟩 20.0-25.0 Ft
🟦 >25.0 Ft
368
CB 347
CB 3

Step 8 (Draw Trench Network Profile):

To draw a profile of the trench line, run the Trench->Draw Trench Network (Profile) command. There is a dialog to select the starting structure for which trench line to process. Choose DCB 368. Also, there are options whether to draw the existing ground, design surface and strata surfaces if available. You can also choose the profile direction to go upstream or downstream. The Save To Profile File will create a profile (.pro) file for the trench. Fill out the dialog as shown and pick OK.


Draw Sewer Network

Upstream Structure: DCB 367

Downstream Structure: CB 347

Profile Direction: ● Downstream ○ Upstream

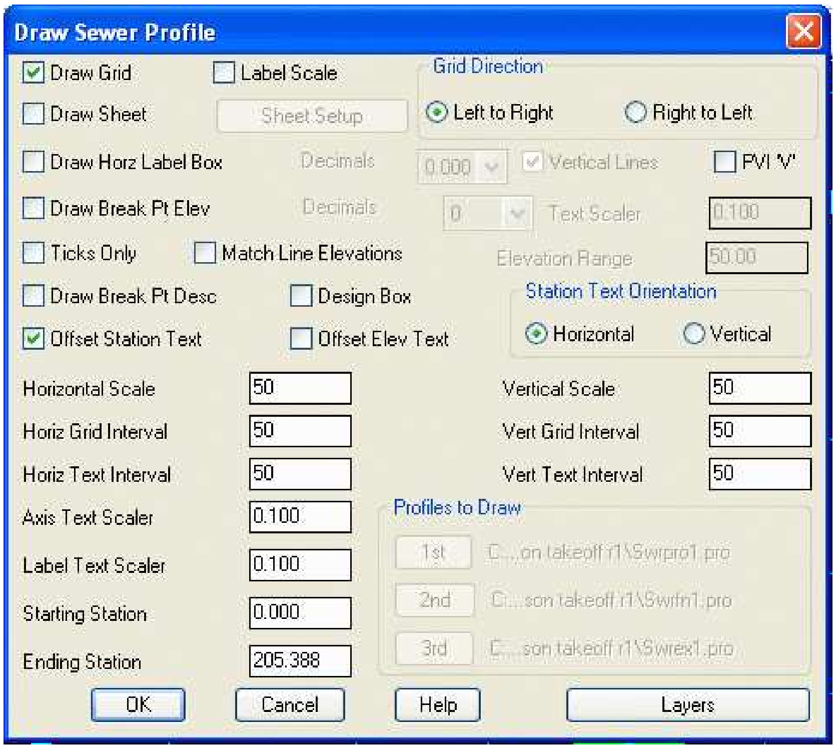
☑ Draw Existing Ground Surface

☑ Draw Final Design Surface

☐ Draw Strata Surface

☐ Save To Profile File

Next the Draw Profile dialog appears. Set the Horizontal Scale and intervals to 50 and the Vertical Scale and intervals to 25. This will make for two to one vertical exaggeration for the profile. When the dialog is filled out as shown, pick OK.


Draw Sewer Profile

☑ Draw Grid ☐ Label Scale

☐ Draw Sheet

Grid Direction: ● Left to Right ○ Right to Left

☐ Draw Horz Label Box Decimals 0.000 ☑ Vertical Lines ☐ PVI 'V'

☐ Draw Break Pt Elev Decimals 0 Text Scaler 0.100

☐ Ticks Only ☐ Match Line Elevations Elevation Range 50.00

☐ Draw Break Pt Desc ☐ Design Box

☑ Offset Station Text ☐ Offset Elev Text

Station Text Orientation: ● Horizontal ○ Vertical

Horizontal Scale	50	Vertical Scale	50
Horiz Grid Interval	50	Vert Grid Interval	50
Horiz Text Interval	50	Vert Text Interval	50
Axis Text Scaler	0.100		
Label Text Scaler	0.100		
Starting Station	0.000		
Ending Station	205.388		

Profiles to Draw:

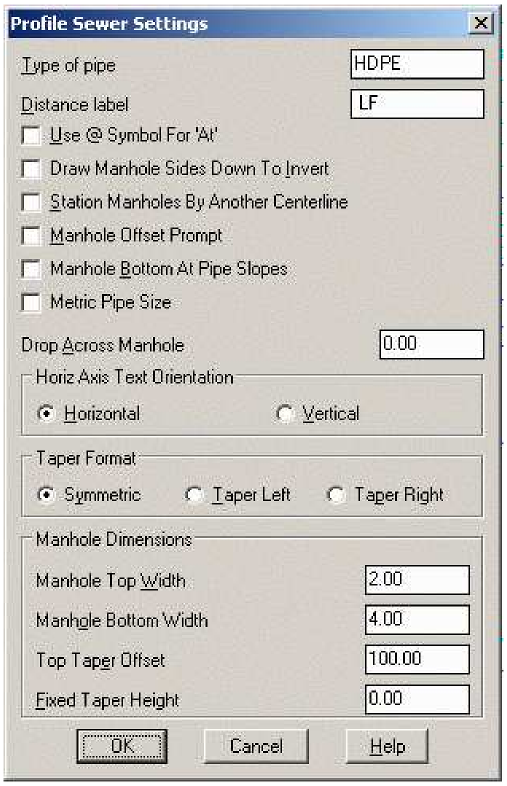
1st C:...on takeoff r1\Swrpro1.pro

2nd C:...son takeoff r1\Swrfn1.pro

3rd C:...son takeoff r1\Swrex1.pro

Next, there are prompts at the command line for the profile grid elevations and profile location.
Bottom Elevation of Profile Grid <150.0>: *Press Enter*
Top Elevation of Profile Grid <200.0>: *Press Enter*
Pick Starting Point for Grid <409458.0 , 207303.0>: *Pick a point in a blank area off to the side of the drawing.*

Next there are two dialogs with lots of settings for how to draw and label the trench profile. Let's go with the defaults except change the Type Of Pipe to HDPE. When the settings are ready, click the OK button for each dialog.



Profile Sewer Settings

Type of pipe: HDPE

Distance label: LF

☐ Use @ Symbol For 'At'

☐ Draw Manhole Sides Down To Invert

☐ Station Manholes By Another Centerline

☐ Manhole Offset Prompt

☐ Manhole Bottom At Pipe Slopes

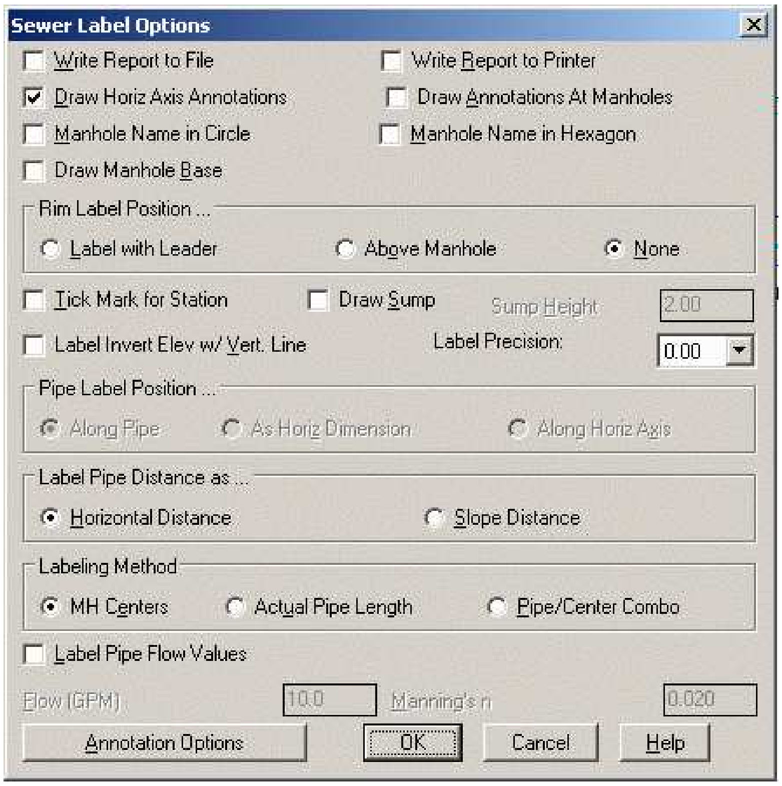
☐ Metric Pipe Size

Drop Across Manhole: 0.00

Horiz Axis Text Orientation
● Horizontal ○ Vertical

Taper Format
● Symmetric ○ Taper Left ○ Taper Right

Manhole Dimensions
Manhole Top Width: 2.00
Manhole Bottom Width: 4.00
Top Taper Offset: 100.00
Fixed Taper Height: 0.00



Sewer Label Options

☐ Write Report to File ☐ Write Report to Printer

☑ Draw Horiz Axis Annotations ☐ Draw Annotations At Manholes

☐ Manhole Name in Circle ☐ Manhole Name in Hexagon

☐ Draw Manhole Base

Rim Label Position ...
○ Label with Leader ○ Above Manhole ● None

☐ Tick Mark for Station ☐ Draw Sump Sump Height: 2.00

☐ Label Invert Elev w/ Vert. Line Label Precision: 0.00

Pipe Label Position ...
● Along Pipe ○ As Horiz Dimension ○ Along Horiz Axis

Label Pipe Distance as ...
● Horizontal Distance ○ Slope Distance

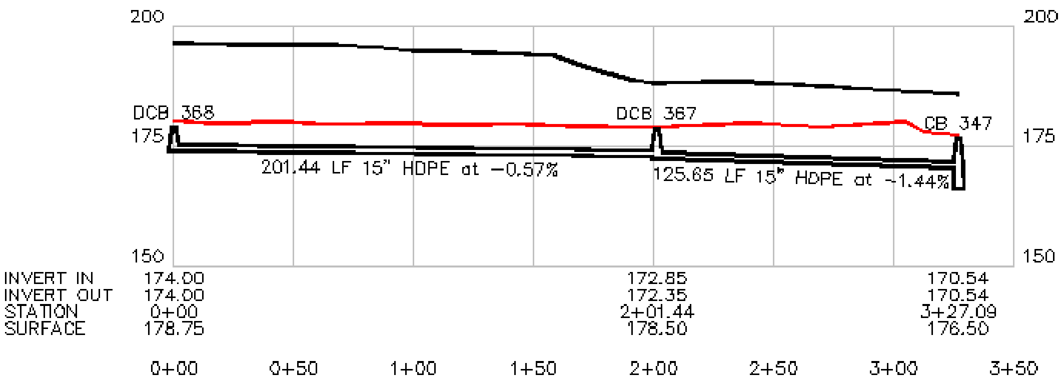
Labeling Method
● MH Centers ○ Actual Pipe Length ○ Pipe/Center Combo

☐ Label Pipe Flow Values

Flow (GPM): 10.0 Manning's n: 0.020

There is a final command line prompt for whether to use the manhole elevations. Enter Yes which will use the rim elevations defined in our trench network.
Use manhole elevations from profile [<Yes>/No]? *Y* for yes.

The profile shows the existing ground at the top, then the design surface and then the trench.

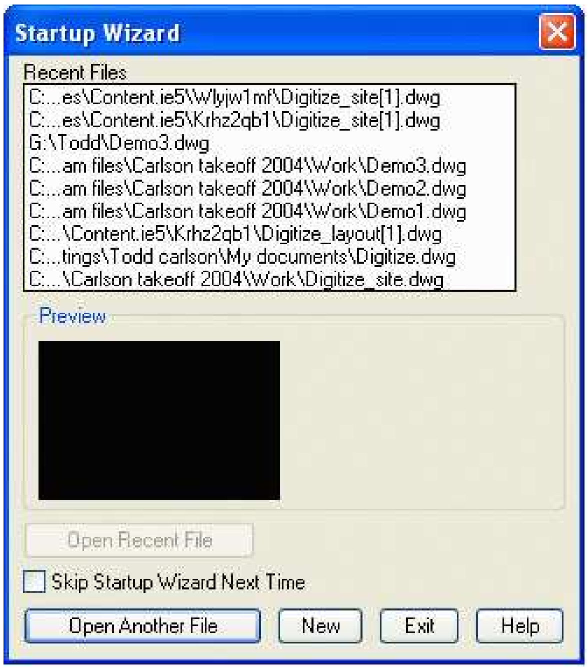


Takeoff Tutorial: Digitizing

This lesson transfers a paper plan into Carlson Civil.

Step 1 (Setup):

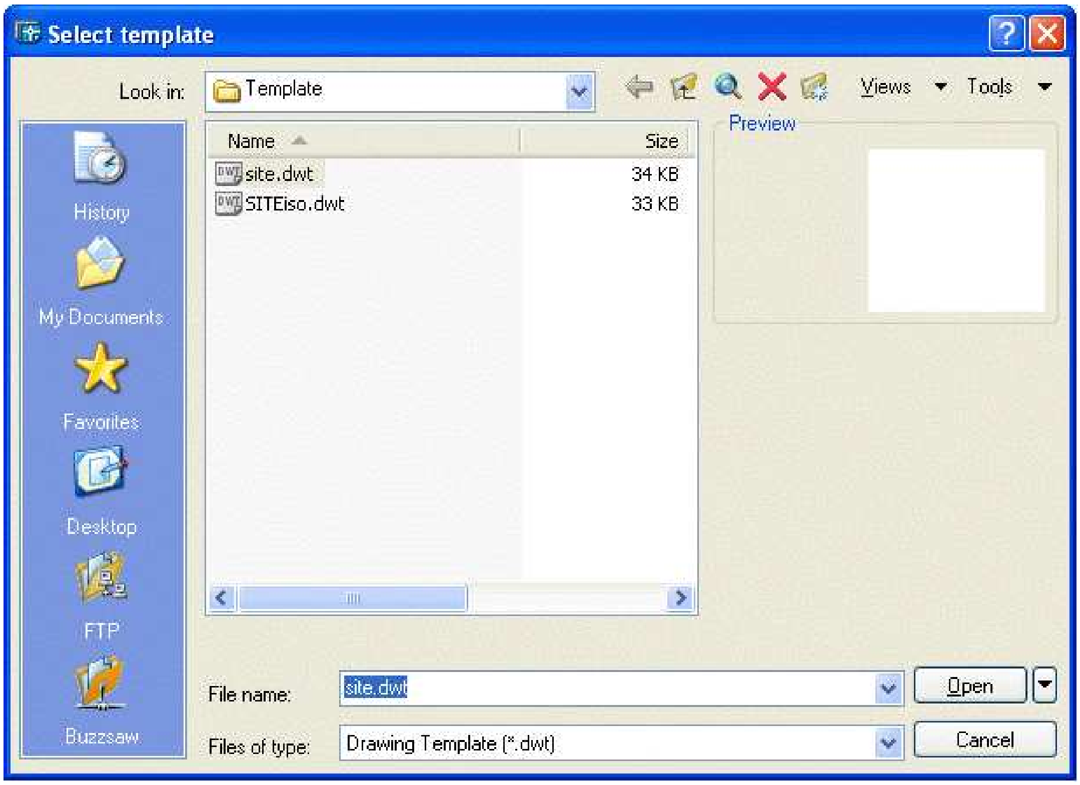
To digitize in Carlson Takeoff, you need to install the Wintab digitizer driver. See Digitizer Setup in the manual if you have not installed or have problems with the Wintab driver. If Wintab is installed, then make sure your drawing board is on and take the paper plan provided with the manual and place it on your drawing board. Click the icon for Takeoff on your desktop or from the toolbar to launch the program. You may be presented with a "Startup Wizard" dialog similar to the one shown below, if so click New.


Startup Wizard

Recent Files

C:...es\Content.ie5\Wlyjw1mf\Digitize_site[1].dwg
C:...es\Content.ie5\Krhz2qb1\Digitize_site[1].dwg
G:\Todd\Demo3.dwg
C:...am files\Carlson takeoff 2004\Work\Demo3.dwg
C:...am files\Carlson takeoff 2004\Work\Demo2.dwg
C:...am files\Carlson takeoff 2004\Work\Demo1.dwg
C:...\Content.ie5\Krhz2qb1\Digitize_layout[1].dwg
C:...tings\Todd carlson\My documents\Digitize.dwg
C:...\Carlson takeoff 2004\Work\Digitize_site.dwg

If a Startup Wizard did not appear, then under File menu, select New to start a new drawing. You will be prompted for a template to use. Templates determine the default settings for your drawing. For this tutorial, select site.dwt and click Open.



Select template

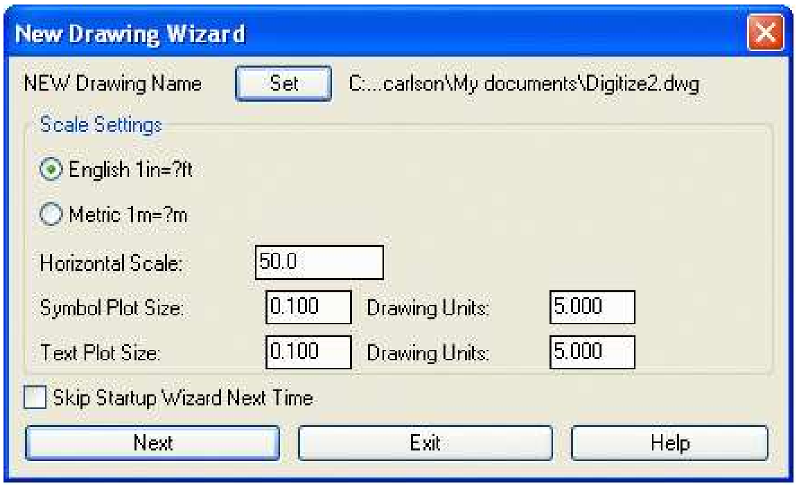
Look in: Template

Name	Size
site.dwt	34 KB
SITEiso.dwt	33 KB

File name: site.dwt

Files of type: Drawing Template (*.dwt)

Next, the New Drawing Wizard appears for setting the drawing name. Click on the Set button at the top dialog. In the file selection dialog, enter the file name of "digitize" and pick the Save button. Then Exit the New Drawing Wizard. From here, a Data Files dialog appears where no changes are needed. Pick the Exit button.



New Drawing Wizard

NEW Drawing Name C:...carlson\My documents\Digitize2.dwg

Scale Settings

● English 1in=?ft

○ Metric 1m=?m

Horizontal Scale: 50.0

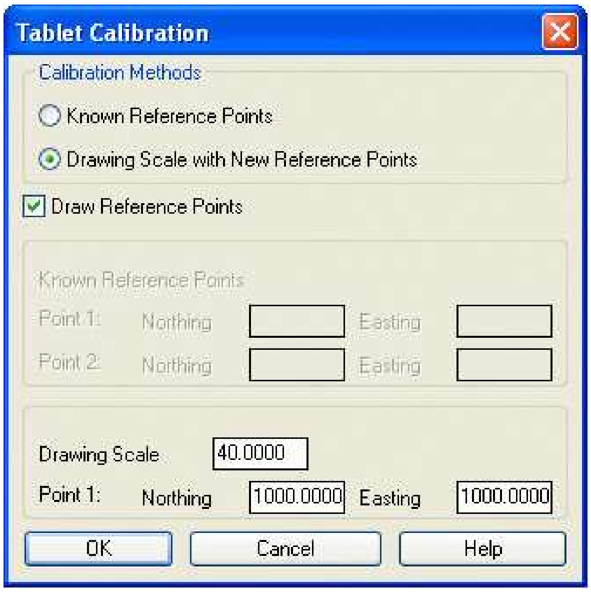
Symbol Plot Size: 0.100 Drawing Units: 5.000

Text Plot Size: 0.100 Drawing Units: 5.000

☐ Skip Startup Wizard Next Time

Step 2 (Tablet Calibration):

To start things off, you need to set the coordinate system for the paper plan by running the Calibrate command under Digitize menu and sub-menu Tablet. Calibration is required to let the program know the orientation and scale of the paper plan.



Calibration Methods

○ Known Reference Points

● Drawing Scale with New Reference Points

☑ Draw Reference Points

Known Reference Points

Point 1: Northing Easting

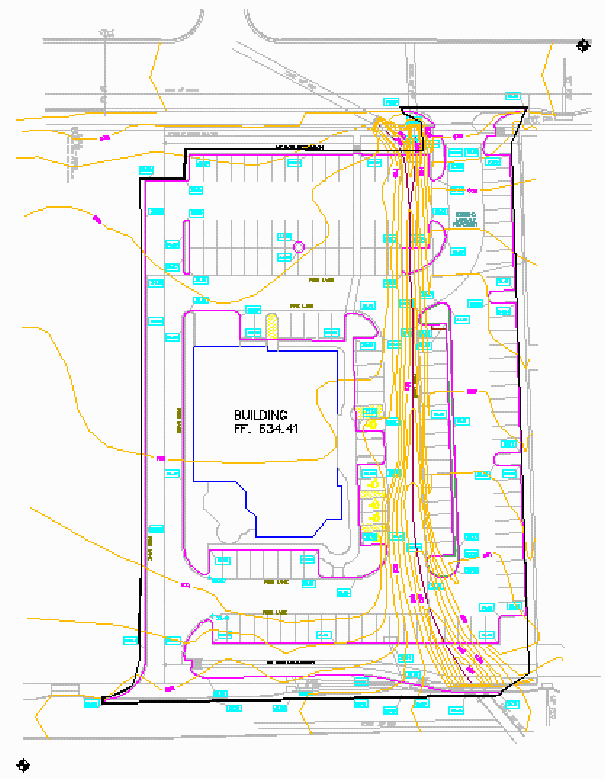
Point 2: Northing Easting

Drawing Scale 40.0000

Point 1: Northing 1000.0000 Easting 1000.0000

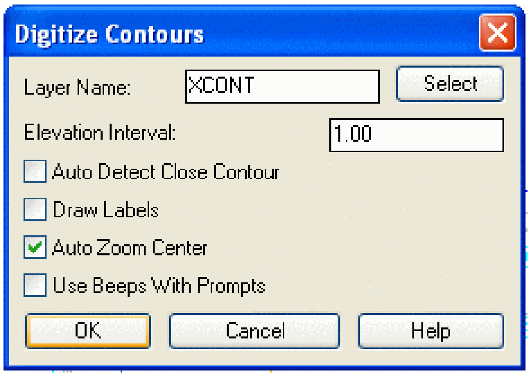
There are two different Calibration Methods: Known Reference Points and Drawing Scale with New Reference Points. Known Reference Points allows you to enter in the coordinates of two marked points on the paper plan. This method applies when you know the coordinates of at least two points on the paper plans. Drawing Scale with New Reference Points allows you to setup a coordinate system for the plans by entering the plan scale and picking any two points from the paper plan with the digitizer puck.

In this case, we will use Drawing Scale with New Reference Points. First, enter in the Drawing Scale listed on the paper plan. On this drawing, the scale is 1:40, so enter in 40. Use the default coordinates for Point 1 and click OK. Now Carlson Takeoff will prompt you for your First and Second Reference points. Generally, you want to pick to points on the drawing that you can find and use again in case you need to recalibrate. Also, the further away the points are from each other, the more accurate the coordinate system will be. With the digitizer puck, pick on the ⌖ icon in the lower left and upper right of the drawing for the two Reference Points. The first point is assigned the coordinates of 1000,1000 from the dialog and the second point is assigned coordinates to match with the plan scale. From now on, all of your points will be in relation to these two points.



Step 3 (Digitizing Existing Contours):

We will now digitize the existing contours. Under the Digitize menu, click on Existing and then go to Contour Polyline, and this dialog will appear. Enter in a Layer Name of XCONT and select OK. Note: your Elevation Interval should match the intervals marked on your paper drawing. In this drawing, the interval is the same as the default of 1.00.



Layer Name: XCONT

Elevation Interval: 1.00

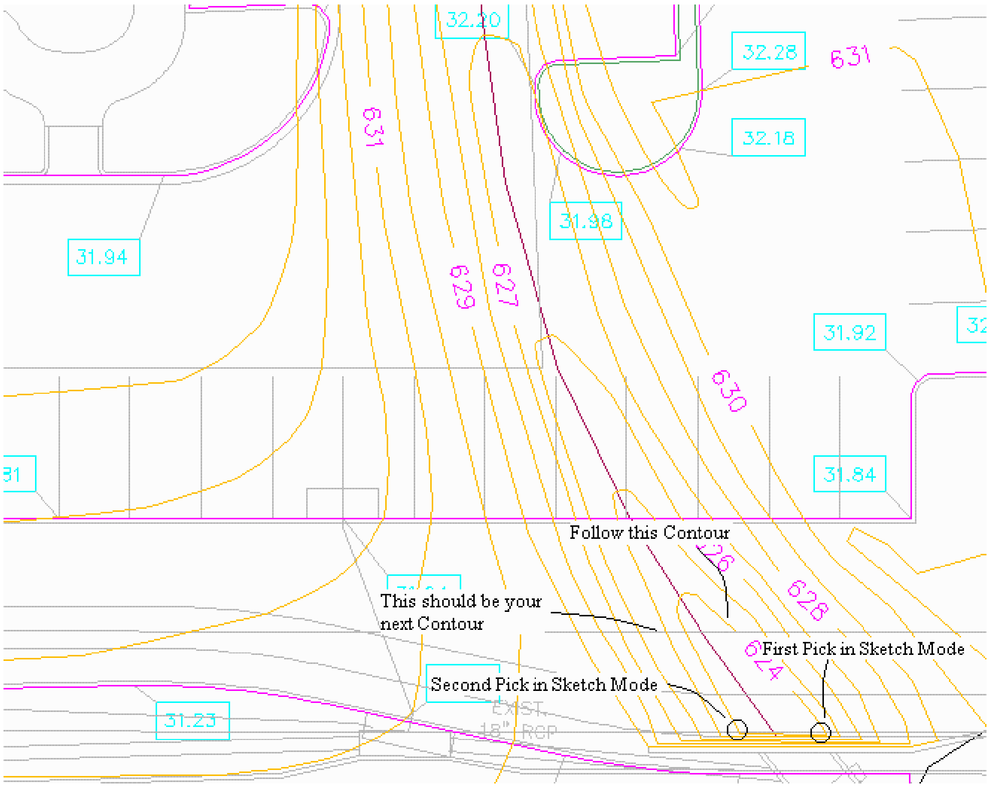
☐ Auto Detect Close Contour

☐ Draw Labels

☑ Auto Zoom Center

☐ Use Beeps With Prompts

The rest of the prompting occurs at the command line and starts with the contour elevation. Find the lowest elevation for the existing contours labeled in bottom right corner of the paper plan zoomed in on below. In this example, the lowest elevation is 624 feet. The elevation can be entered either with the digitizer puck keys or with the computer keyboard. The layout of the digitizer keys is set in Digitizing Settings->Puck Layout. Press Enter after you have entered in 624. You want to enter in the lowest contour so that as Carlson Takeoff adds the Elevation Interval, it is from lowest to highest.



Next, you will see the following prompt:

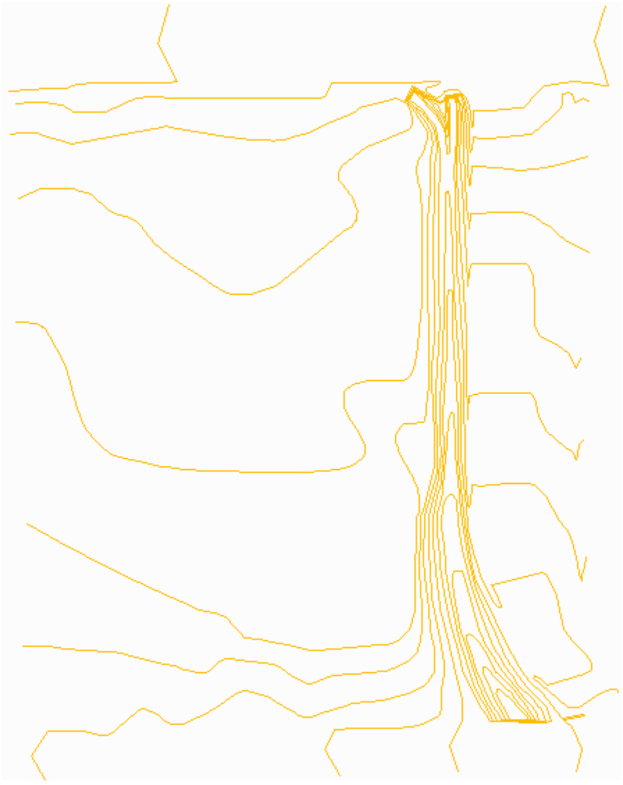
Sketch[0]/Exit[A]/Pick the first point:

There are two different ways to digitize: in Pick Mode or Sketch Mode. You can switch between them at anytime. In this tutorial we will run through how to do both. For now, type in [0] and press enter to get into Sketch Mode. In Sketch Mode, you will be prompted to Pick and drag. The point you pick is the starting point of a contour. Drag is asking you to follow that contour with the digitizer puck on the paper plan. Click a second time when you have traced the entire contour and have reached the end of the contour. You will then be prompted as follows:

Pick[0]/Close[A]/Undo[B]/Pick and drag (Enter to end):

Type in [B] for Undo if you made a mistake and need to sketch part of the contour again. [A] will close the contour, and [0] will switch you into Pick Mode. We still have more existing contours to digitize, so press Enter to end and answer yes to the Digitize Another Contour prompt. Takeoff will prompt you to verify the elevation. Remember, we set the Elevation Interval to one, so the default elevation for your next contour line is 625, press Enter. Now, pick the endpoint of the next contour and trace it in the same manner as the previous contour.

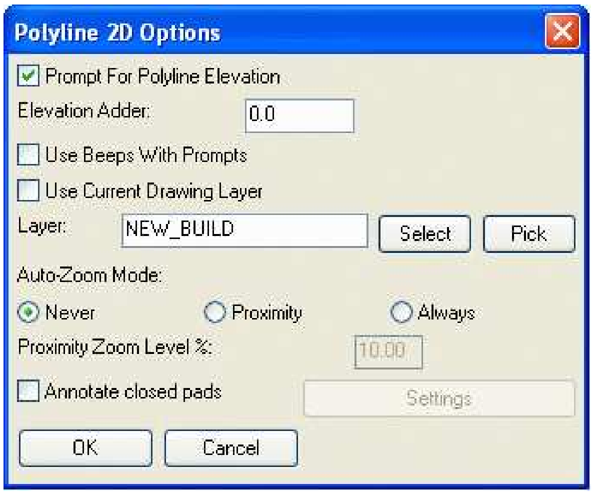
Now let's try Pick Mode. Say yes to digitize another contour and check to see if the default elevation corresponds with the contour your about to digitize. If not, simply type in the correct number in the command line. Next, pick [0] to get into Pick Mode. In Pick Mode, you do not have to trace the contour. Rather, pick with the digitizer puck to create points that will make up the contour. Note: Less picks are needed on fairly straight segments. Conversely, more picks will give you a more accurate contour. Press Enter when you have reach the end of the contour. Repeat this until you have digitized all of the existing contours you want to have in Takeoff (see below).



Step 4 (Digitizing the Design):

Now we will digitize the building and curb linework of the Design Surface using the Digitize 2D Polyline and 3D Polyline commands. Besides drawing the linework positions, we will also assign layer names to the linework that we will use later to identify the types of linework. In this example, there are no design contours, only the design building and curb linework and spot elevations.

Let's begin by digitizing the main building. Under Digitize, check on Design and go to 2D Polyline. 2D Polyline is used to digitize linework entities with one elevation. Toggle off the check box **Use current drawing layer** and name the layer NEW BUILD. Toggle on the **Prompt For Polyline Elevation** option. Then click OK.



Polyline 2D Options

☑ Prompt For Polyline Elevation

Elevation Adder: 0.0

☐ Use Beeps With Prompts

☐ Use Current Drawing Layer

Layer: NEW_BUILD

Auto-Zoom Mode:

● Never ○ Proximity ○ Always

Proximity Zoom Level %: 10.00

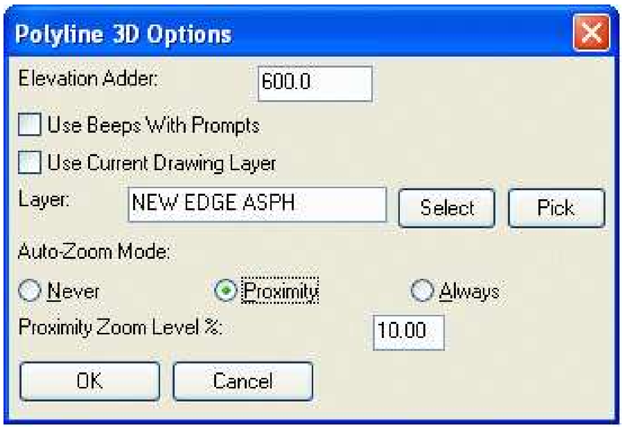
☐ Annotate closed pads

At the command line, enter in the building elevation of 634.41 found labeled in the middle of the building and press Enter. Then pick the points that define the building outline. Start in the upper left corner and pick at every corner around the building. When you have picked around the entire building, type in [A] for close to finish digitizing the building.

Enter polyline elevation <0.00>: *634.41*
First point: *pick a building point*
Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick the next building point*
Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick the next building point*
Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick the last building point*
Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *A to close*

Digitize Another NEW_BUILD Polyline [Yes(A)/<No(B)>]? *B for No*

Notice that the parking lot linework consists of different elevation levels. To digitize entities with more than one elevation, go to Digitize and select 3D Polyline from the pull-down menu. Make sure that the **Prompt For Polyline Elevation** option is on, the **Use current drawing layer** toggle is off and name the layer NEW EDGE ASPH.



Polyline 3D Options

Elevation Adder: 600.0

☐ Use Beeps With Prompts

☐ Use Current Drawing Layer

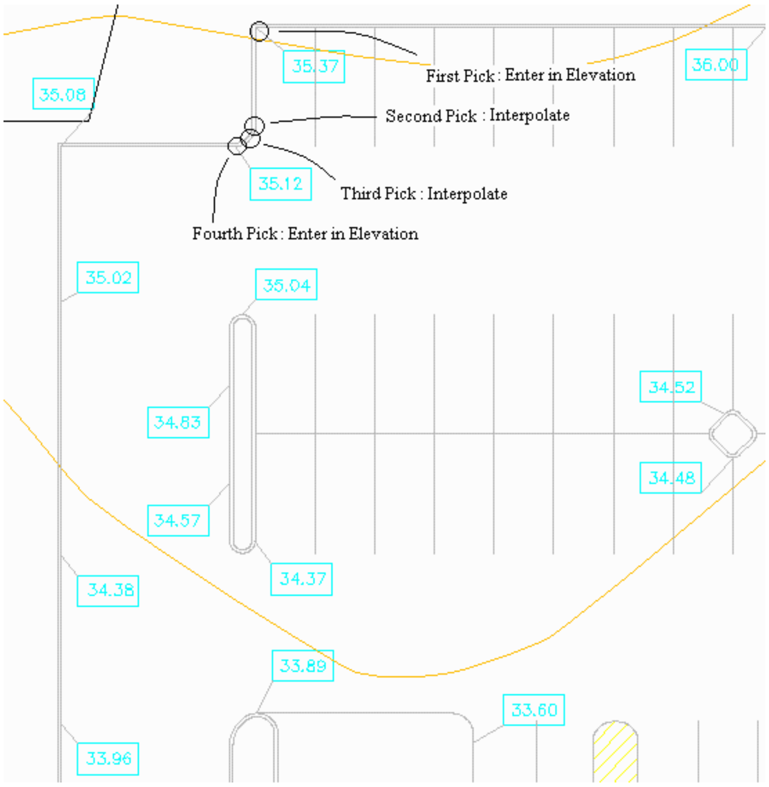
Layer: NEW EDGE ASPH

Auto-Zoom Mode:

○ Never ● Proximity ○ Always

Proximity Zoom Level %: 10.00

Let's start by digitizing the parking lot starting from the zoomed in section below. The edge of asphalt is the inside line. The parking lot elevation labels have been shortened on the paper plan. For example, they read 35.37 and 35.12, when the actual elevations are 635.37 and 635.12. Enter in 600 as the Elevation Adder, then click OK.



First Pick : Enter in Elevation

Second Pick : Interpolate

Third Pick : Interpolate

Fourth Pick : Enter in Elevation

Click on the point with the digitizer puck where the 35.37 elevation label points to in the upper left corner of the parking lot. When prompted for Elevation enter in 35.37. Pick below the first point where the linework starts to curve. We do not have an elevation for this point, but we can interpolate the elevation from the two points around it using the interpolate option. Type in I for interpolate or hit the A button on the Puck. Next pick the middle point of the curve and again use Interpolate for the elevation. Next pick the end of the curve at the 35.12 label and enter in the elevation 35.12. Continue digitizing for the rest of the edge of asphalt linework. Digitize each point where there is an elevation label and each point where the curb line changes direction.

The first prompts should resemble these:

First point: *pick first point (at 35.37 label)*
Interpolate[A]/screen Pick/<Elevation[B]> <0.00>: *35.37*

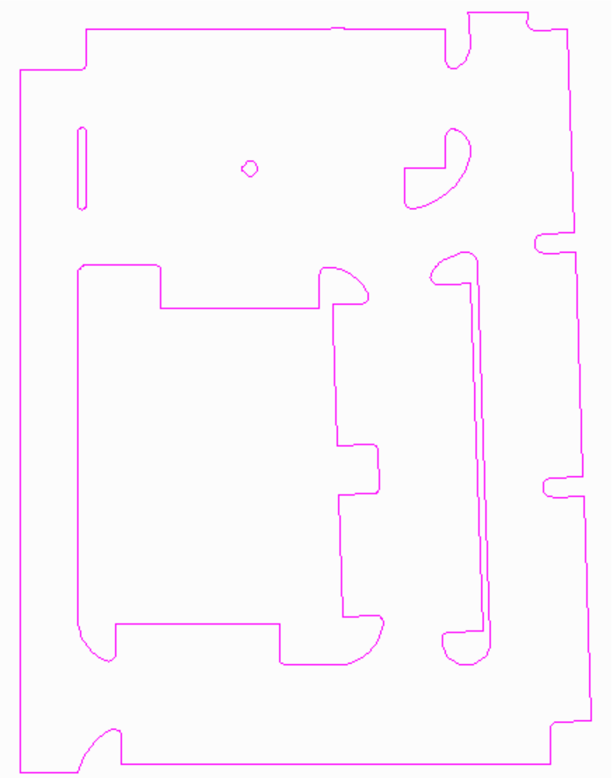
Z: 635.37
Close[A]/Undo[B]/Osnap[.]/Pick next point (Enter to end): *pick next point (start of curve)*
Slope/Ratio/Interpolate[A]/Degree/screen Pick/<Elevation[B]> <635.37>: Press the [A] button on the Puck for Interpolate

Slope/Ratio/Elevation[B]/Degree/screen Pick/Osnap[.]/Next point or elevation<Interpolate>: *pick next point (middle of curve)*
This point elevation will be interpolated upon completion.
Slope/Ratio/Elevation[B]/Degree/screen Pick/Osnap[.]/Next point or elevation<Interpolate>: *pick next point (end of curve, at 35.12 label)*
This point elevation will be interpolated upon completion.

Slope/Ratio/Elevation[B]/Degree/screen Pick/Osnap[.]/Next point or elevation<Interpolate>: *35.12 (Enter)*

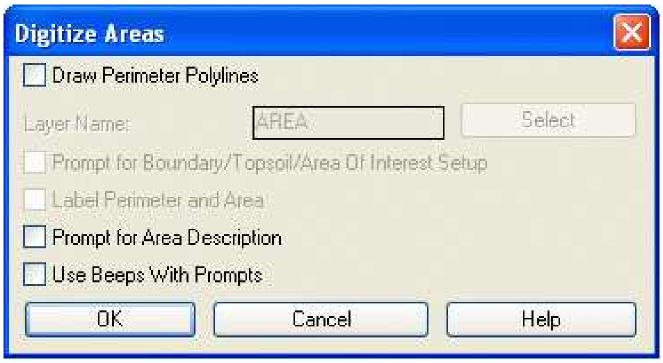
To check the elevations of the interpolated points go to List under the Inquiry menu and click on the polyline you just created and press Enter. A text window will appear showing you the layer name, coordinates, and elevation of each point. To return to the main graphic screen, press F2.

Use the 3D Polyline command to digitize the rest of the parking lot as seen below.



Step 5 (Area):

Now that we have digitized the Design Surface, let's check the Area of certain sections. Select Area under the Digitize Menu and match the below dialog.



Digitize Areas

☐ Draw Perimeter Polylines

Layer Name: AREA

☐ Prompt for Boundary/Topsoil/Area Of Interest Setup

☐ Label Perimeter and Area

☐ Prompt for Area Description

☐ Use Beeps With Prompts

To approximate the area of the main building, pick the points of the building outline.

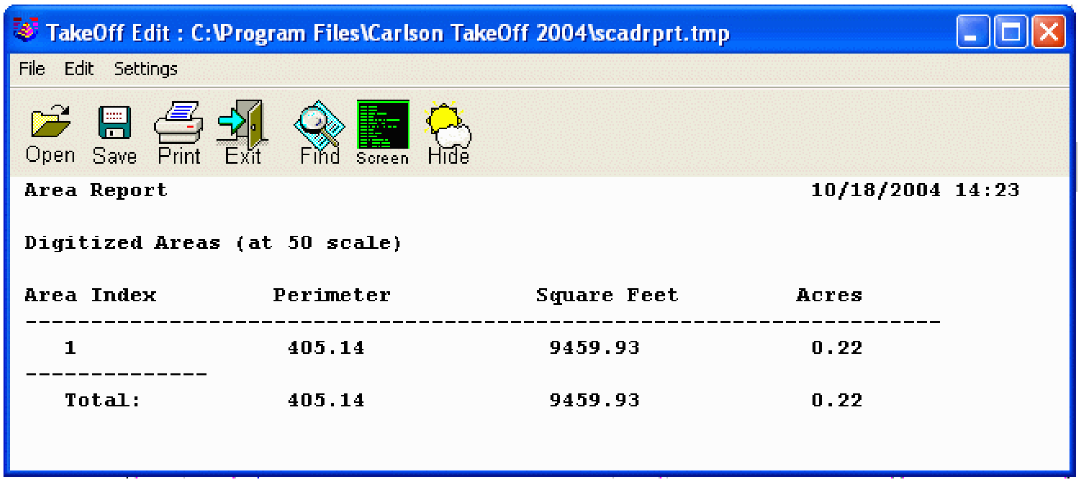
Command: *dig_area*

Pick starting point: *Pick points as close to the building design linework as you can*
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):
Undo[B]/Pick next point (Enter to end):

Undo[B]/Pick next point (Enter to end):

Digitize Another Area [<Yes(A)>/No(B)]? *B*

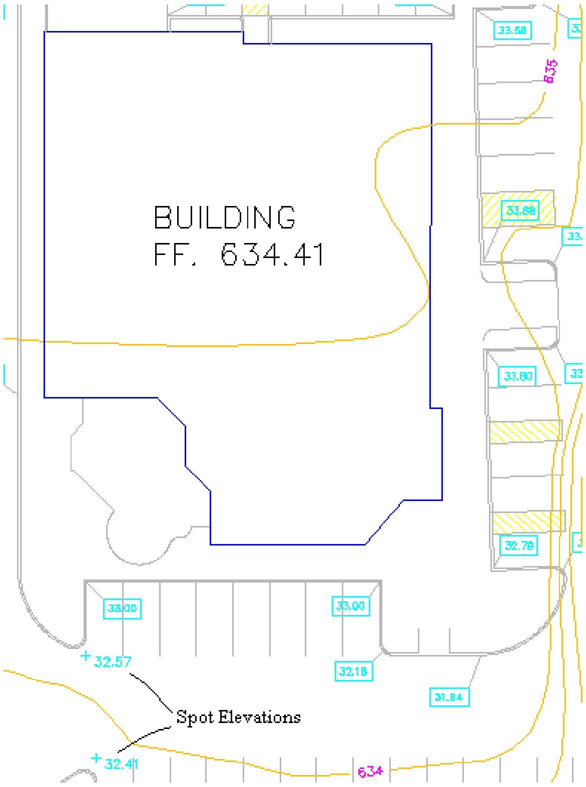
When finished with the building points, press Enter to end. Then answer no for no more areas. Takeoff will then display an Area report similar to the one shown below.


TakeOff Edit : C:\Program Files\Carlson TakeOff 2004\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

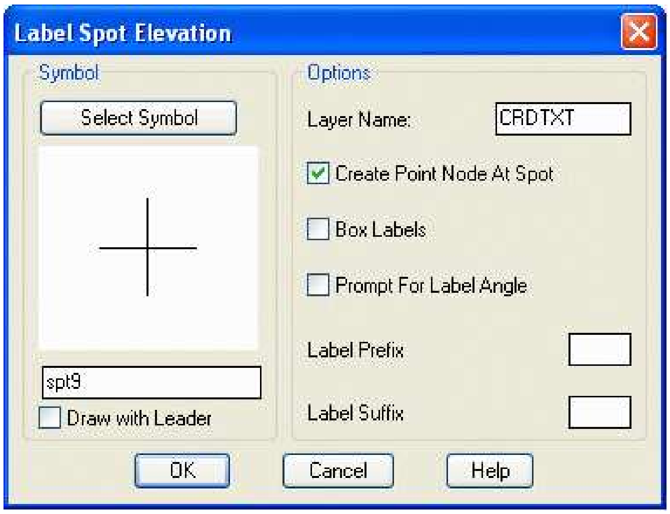
```
Area Report                                              10/18/2004 14:23

Digitized Areas (at 50 scale)

Area Index          Perimeter           Square Feet         Acres
----------------------------------------------------------------------
   1                 405.14              9459.93             0.22
--------------
   Total:            405.14              9459.93             0.22
```

Step 6 (Spot Elevations):

In our paper drawing, we have two spot elevations labeled 32.57 and 32.41 shown in the bottom left below.


BUILDING
FF. 634.41
33.58
635
33.88
33.80
32.78
33.00
33.00
32.57
32.18
31.84
Spot Elevations
32.41
634

To digitize these elevations, we can use the Spot Elevation command under the Digitize menu. Fill out the Spot Elevation dialog as shown and pick OK.


Label Spot Elevation
Symbol
Select Symbol
Options
OK
Cancel
Help

spt9

☐ Draw with Leader

Layer Name: CRDTXT

☑ Create Point Node At Spot

☐ Box Labels

☐ Prompt For Label Angle

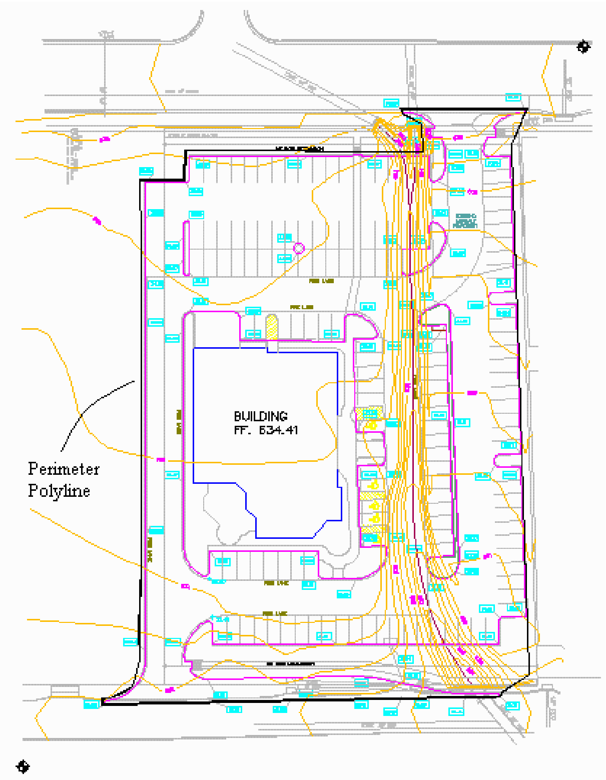
Label Prefix

Label Suffix

In the paper plan, find and click on the spot elevations with the puck. When prompted, enter in their corresponding elevations of 632.57 and 632.41.

Step 7 (Boundary Polyline):

The limits of the site are defined by a closed polyline. This polyline is used as the boundary for the models and the volumes. Under the digitize menu, check on Other and then select Perimeter. Type in PERIMETER as the layer name. Now digitize around the bold, outside line shown below.


BUILDING
FF. 634.41
Perimeter
Polyline

Say No to the prompt: **Digitize Another PERIMETER Polyline [Yes(A)/<No(B)>]?**

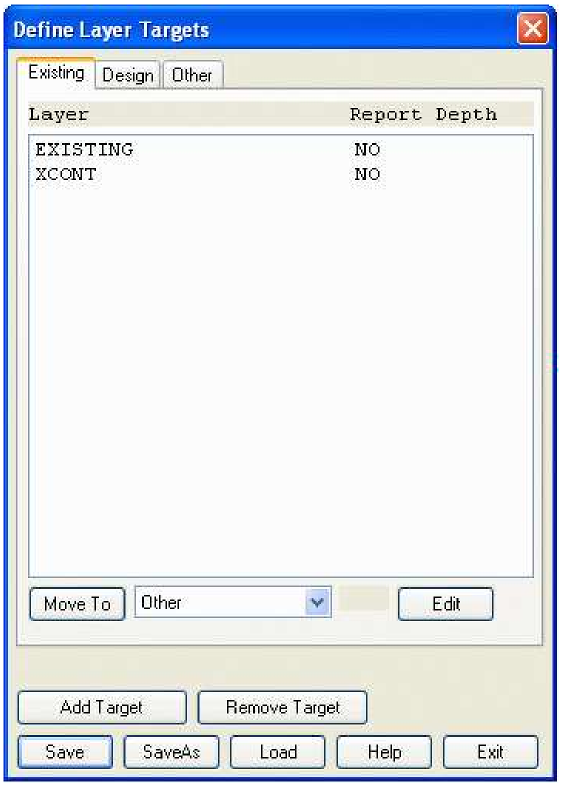
Now run Tools->Boundary Polyline->Set Boundary Polyline and pick the perimeter polyline. This selected polyline is now set as the boundary polyline for the rest of the Takeoff routines.

Step 8 (Layer Targets):

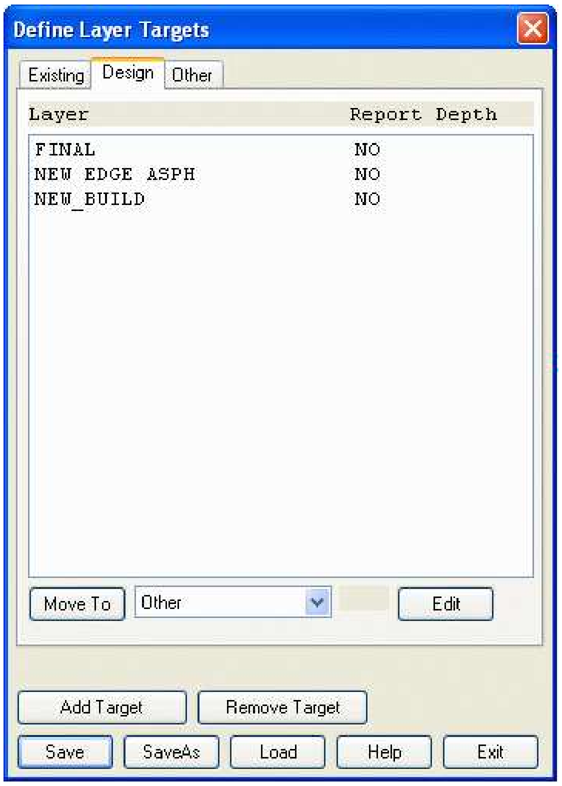
From the Tools menu, choose Define Layer Target/Material/Subgrade. Every entity (line, polyline, point, etc) in the drawing is assigned a layer name. Takeoff uses the entity layer names to define which entities are for the existing ground surface, the design surface or no surface. These surfaces are referred to as the "Target" surfaces. The drawing entities are assigned their target surface by their layer name. For example, if polylines representing design contours are on the layer "NEW", then "NEW" will be set as a layer for the design surface. For layers of entities that are for neither existing nor design surfaces (such as text labels for street names), the layer target is set to Other.

The Define Layer Targets dialog has three lists of layers: Existing, Design and Other. To switch between lists, pick the tabs at the top of the dialog. We have already defined the layers for their correct targets. We did this by check on Existing, Design, or Other in the pull-down menu.

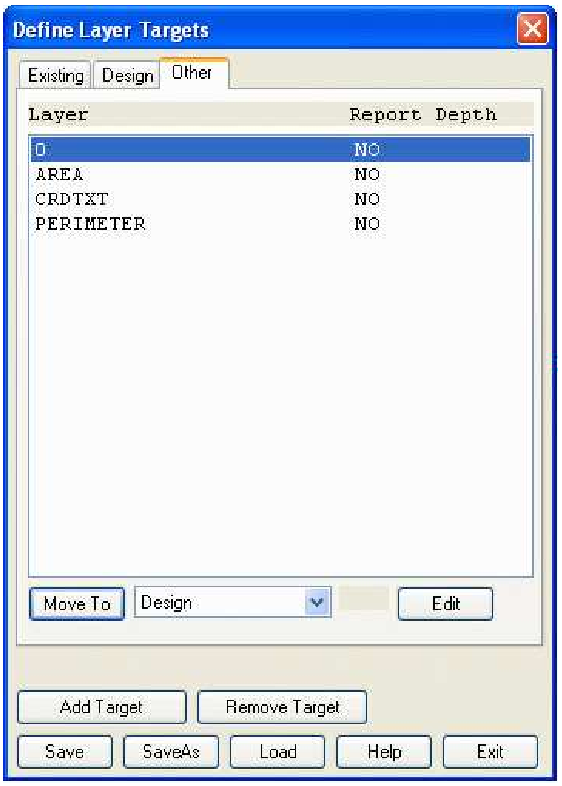
Check that your Layer Targets resemble the three lists shown here. If a layer is out of place, highlight it, and hit the "Move To" button after selecting the correct target to send it to. After reviewing, pick Save and Exit.



Layer	Report Depth
EXISTING	NO
XCONT	NO


Define Layer Targets
Existing
Design
Other
Move To
Other
Edit
Add Target
Remove Target
Save
SaveAs
Load
Help
Exit

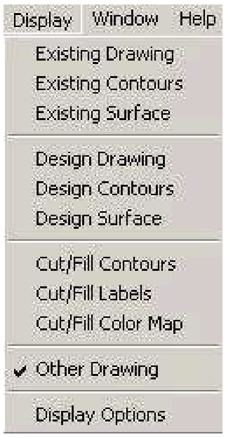
Layer	Report Depth
FINAL	NO
NEW EDGE ASPH	NO
NEW_BUILD	NO


Define Layer Targets
Existing
Design
Other
Move To
Design
Edit
Add Target
Remove Target
Save
SaveAs
Load
Help
Exit

Layer	Report Depth
0	NO
AREA	NO
CRDTXT	NO
PERIMETER	NO

Now that the layer targets are defined, there are several commands that can be applied. In the Display menu, you can turn on/off whether to display layer targets by using Existing Drawing, Design Drawing and Other Drawing, or by right-clicking with your mouse. For example, when Design Drawing is checked, then picking this menu item will uncheck it and turn off all the layers for the design surface. Likewise, picking Design Drawing when it is unchecked will make it checked and turn on the design surface layers.

Practice turning on/off the Existing, Design and Other Drawing in the Display menu. When only Existing Drawing is on, you should see just the contours. When only Design Drawing is on, you should see just the design polylines and leader labels. When only Other Drawing is on, you should see the entities that are assigned to neither existing nor design.

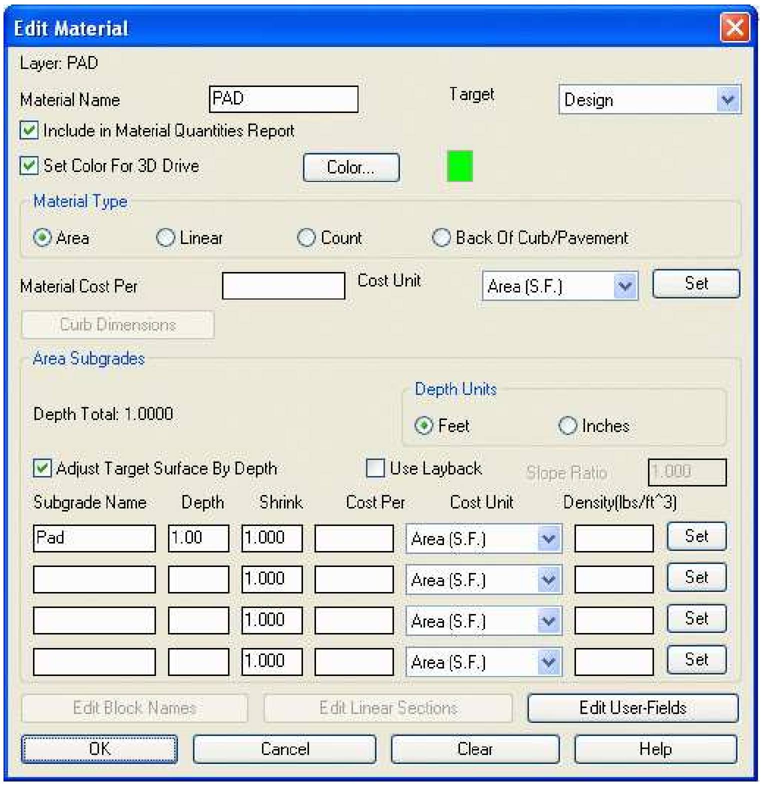

Display
Window
Help
Existing Drawing
Existing Contours
Existing Surface
Design Drawing
Design Contours
Design Surface
Cut/Fill Contours
Cut/Fill Labels
Cut/Fill Color Map
✓ Other Drawing
Display Options

Step 9 (Define Material/SubGrade):

Besides assigning target surfaces by layer, layers are also used to define material names and subgrade depths. By assigning material names and depths to layers, the volume, area, length and count for entities on these layers can be reported. Also the depth is used to vertically adjust the design surface. The polylines used for subgrade depth must be closed polylines. Takeoff supports nested subgrade polylines for exclusion areas such as islands by counting how many subgrade polylines surround an area. If the number is odd, then the area is inside the subgrade. Otherwise the area is not part of the subgrade.

First, let's confirm the layer names for our subgrades. Go to the Display menu and check on Design Drawing, uncheck Existing Drawing and uncheck Other Drawing. Then run Inquiry->Layer ID and pick the large pad polyline. It reports that this layer is NEW BUILD. Next use Layer ID to pick the curb polyline. It reports that this layer is NEW EDGE ASPH.

Now run Define Layer Target/Material/Subgrade and pick the Design tab. Highlight layer NEW BUILD and pick the Edit button. A dialog appears for defining the pad material properties. Check on the Include In Material Report option, enter the Material Name as "Pad", set the first subgrade name to "Pad", and set the Depth as 1. Once the dialog is filled out as shown, pick OK.



Edit Material

Layer: PAD

Material Name: PAD

Target: Design

☑ Include in Material Quantities Report

☑ Set Color For 3D Drive 🟩

Material Type: ● Area ○ Linear ○ Count ○ Back Of Curb/Pavement

Material Cost Per: — Cost Unit: Area (S.F.)

Area Subgrades

Depth Total: 1.0000

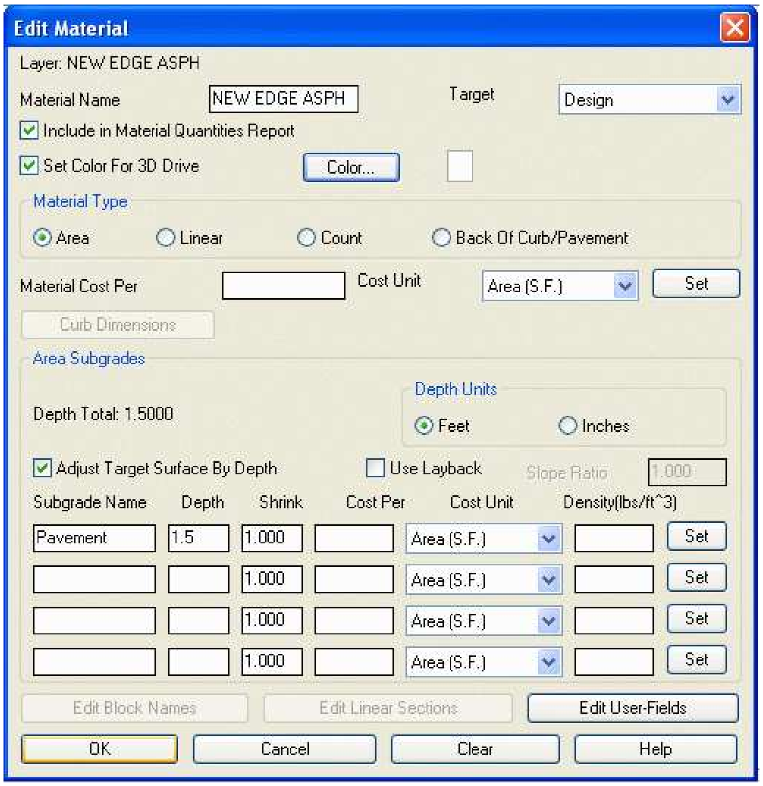
Depth Units: ● Feet ○ Inches

☑ Adjust Target Surface By Depth ☐ Use Layback Slope Ratio 1.000

Subgrade Name	Depth	Shrink	Cost Per	Cost Unit	Density(lbs/ft^3)
Pad	1.00	1.000		Area (S.F.)	
		1.000		Area (S.F.)	
		1.000		Area (S.F.)	
		1.000		Area (S.F.)	

Color...
Set
Curb Dimensions
Edit Block Names
Edit Linear Sections
Edit User-Fields
OK
Cancel
Clear
Help

Next pick layer NEW EDGE ASPH and choose Edit. In the Edit Materials dialog, check on Include In Material Report, set the Material Name to "Pavement", set the first subgrade name to "Pavement", and set the Depth to 1.5. Then pick OK.



Edit Material

Layer: NEW EDGE ASPH

Material Name: NEW EDGE ASPH

Target: Design

☑ Include in Material Quantities Report

☑ Set Color For 3D Drive ☐

Material Type: ● Area ○ Linear ○ Count ○ Back Of Curb/Pavement

Material Cost Per: — Cost Unit: Area (S.F.)

Area Subgrades

Depth Total: 1.5000

Depth Units: ● Feet ○ Inches

☑ Adjust Target Surface By Depth ☐ Use Layback Slope Ratio 1.000

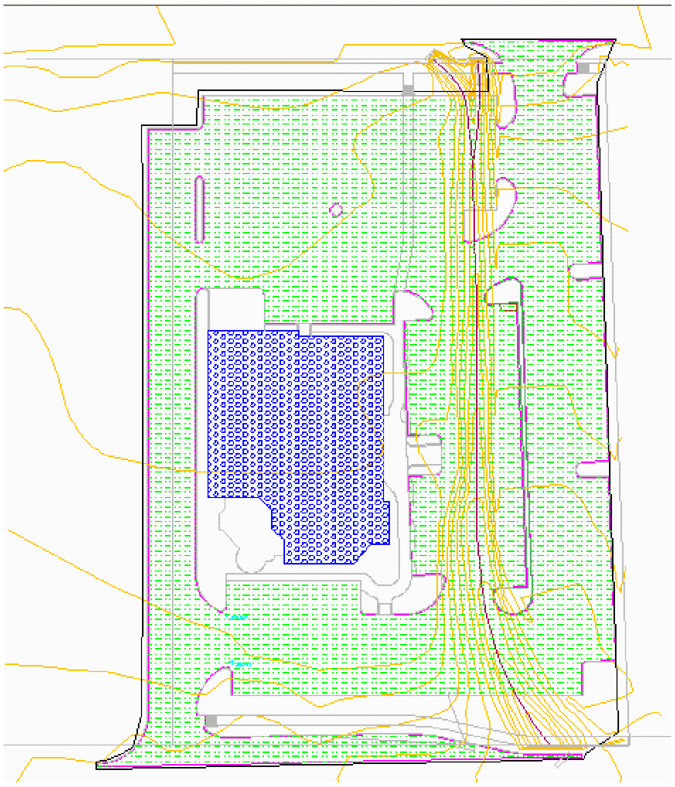
Subgrade Name	Depth	Shrink	Cost Per	Cost Unit	Density(lbs/ft^3)
Pavement	1.5	1.000		Area (S.F.)	
		1.000		Area (S.F.)	
		1.000		Area (S.F.)	
		1.000		Area (S.F.)	

Color...
Set
Curb Dimensions
Edit Block Names
Edit Linear Sections
Edit User-Fields
OK
Cancel
Clear
Help

To save the subgrade changes, pick the Save button on the Define Layer Targets dialog. Then choose Exit.

Now let's visually verify the subgrade areas. In the TakeOff menu, run Subgrade Areas->Hatch Subgrade Areas.

There is a dialog to select which subgrade to hatch. Choose the Pavement. Then there is a dialog for the hatch pattern and color. Change the color to green and click OK. Then run Hatch Subgrade Areas again. This time choose Pad and set the hatch pattern to Hex with blue color. The resulting hatch areas show where the subgrade is applied. Notice how the islands are not hatched because they are curb polylines that are already inside another curb polyline. When finished viewing the subgrade areas, run TakeOff->Subgrade Areas->Erase Subgrade Hatches.

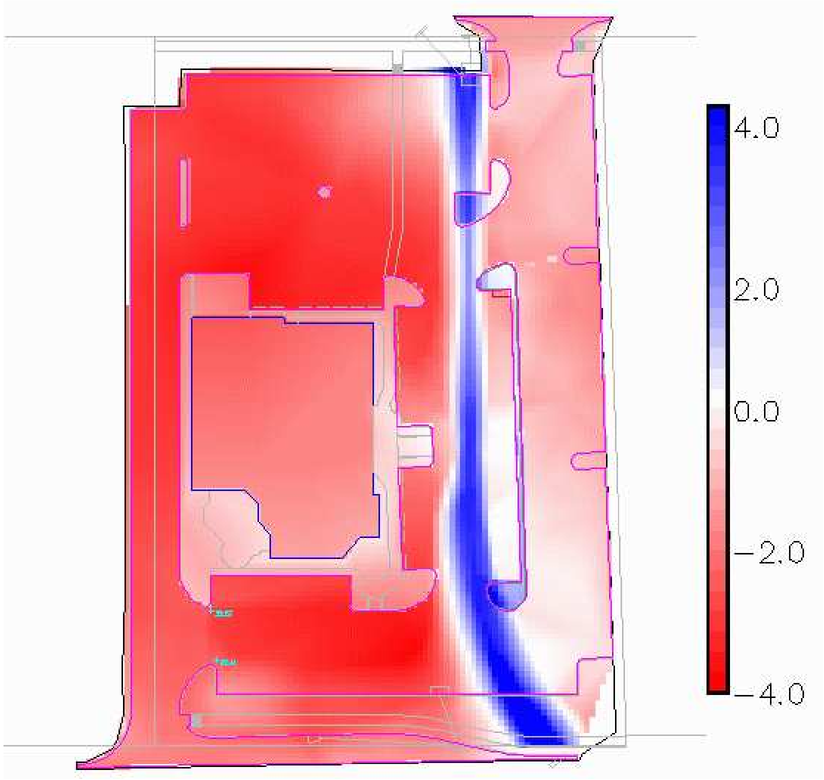


Step 10 (Model Existing and Design Surfaces):

To calculate volumes, Takeoff needs two surfaces: existing ground and design. These surfaces are modeled by triangulation. With the preparation of the previous steps, we're now ready to make the models. To make the existing ground surface, run Tools->Make Existing Ground Surface. The program will process the entities and make the triangulation surface. Then to make the design surface, run Tools->Make Design Surface.

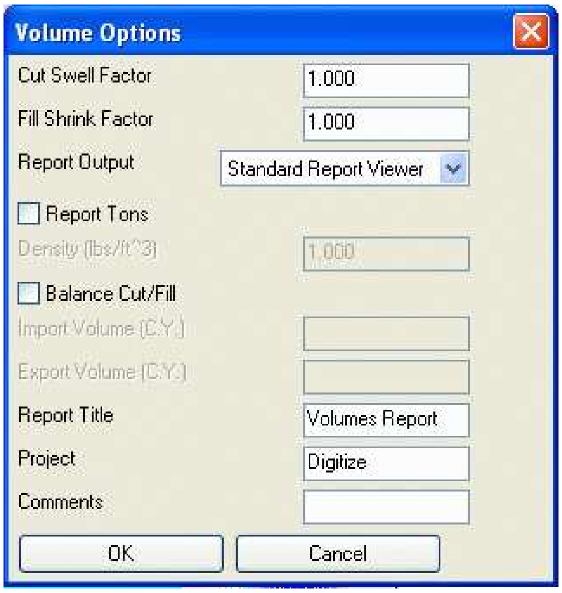
Step 11 (Cut/Fill Color Map):

Cut/Fill color maps can be used for a visual output of the site cut/fill areas and also serves as a check that the models are correct. In the Display menu, choose Cut/Fill Color Map. Cut areas are drawn in different shades of red for different depths of cut while fill areas are drawn in blue. To change the resolution of the color blocks, run Display->Display Options and change the Cut/Fill Color Map Subdivisions. This parameter is the number of rows and columns of color blocks to create. You can also draw a legend for the Color Map by going to Draw, Cut/Fill Map Legend. Pick a point on your drawing to locate the legend and press Enter. To turn off the color map, go to the Display menu and pick Cut/Fill Color Map to uncheck it.



Step 12 (Calculate Volumes):

To calculate volumes, run the TakeOff->Calculate Total Volumes command. There is an options dialog for setting the cut swell factor and fill shrink factor. These values get multiplied into the cut/fill volumes. Set these factors as desired and click OK. Then the routine calculates the volumes and display the report which includes the cut/fill volumes and areas. The report can be printed or saved to a file. Pick the Exit button to exit the report viewer.



Cut Swell Factor 1.000

Fill Shrink Factor 1.000

Report Output Standard Report Viewer

☐ Report Tons

Density (lbs/ft^3) 1.000

☐ Balance Cut/Fill

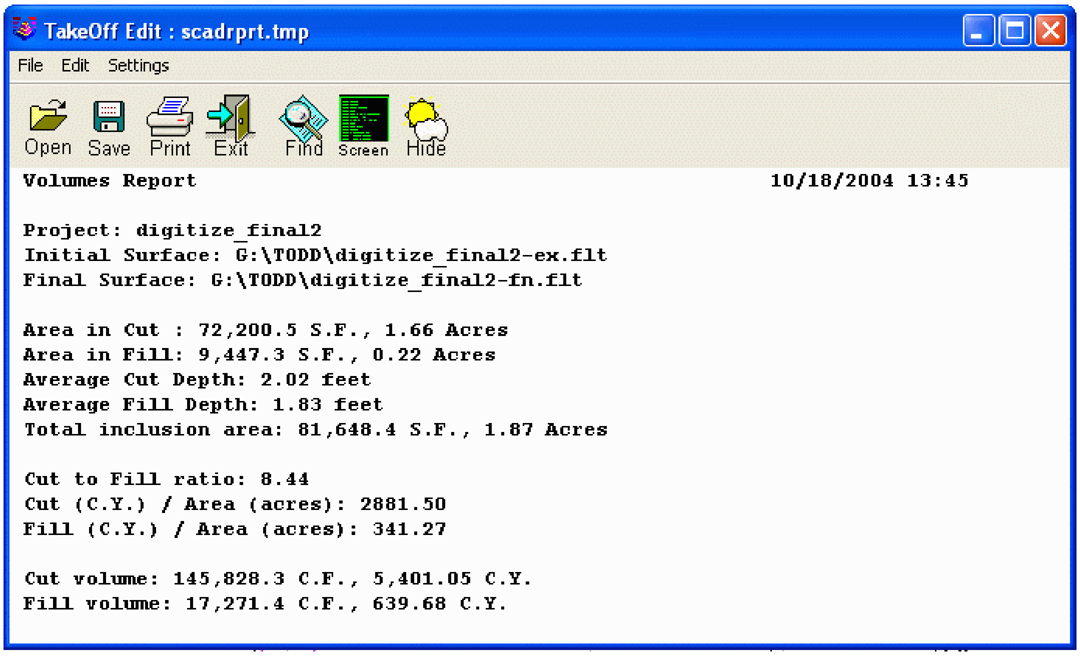
Import Volume (C.Y.)

Export Volume (C.Y.)

Report Title Volumes Report

Project Digitize

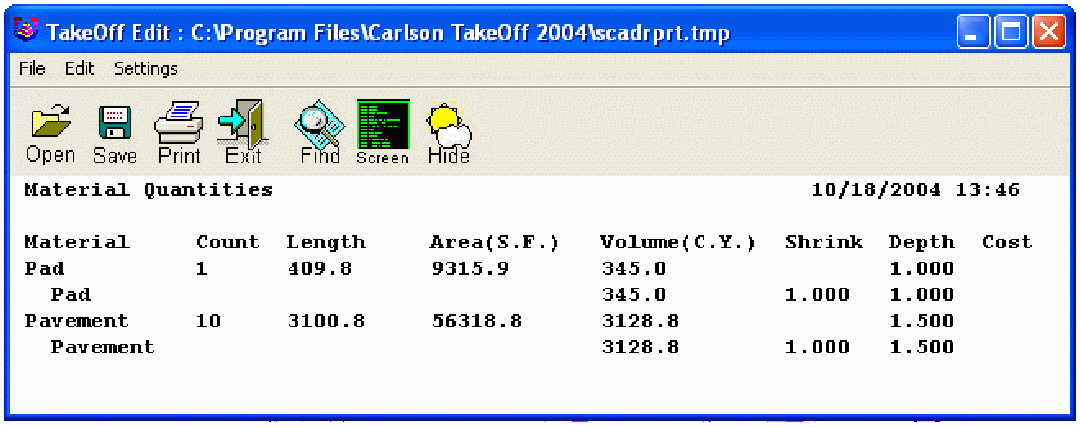
Comments


TakeOff Edit : scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Volumes Report                                              10/18/2004 13:45

Project: digitize_final2
Initial Surface: G:\TODD\digitize_final2-ex.flt
Final Surface: G:\TODD\digitize_final2-fn.flt

Area in Cut : 72,200.5 S.F., 1.66 Acres
Area in Fill: 9,447.3 S.F., 0.22 Acres
Average Cut Depth: 2.02 feet
Average Fill Depth: 1.83 feet
Total inclusion area: 81,648.4 S.F., 1.87 Acres

Cut to Fill ratio: 8.44
Cut (C.Y.) / Area (acres): 2881.50
Fill (C.Y.) / Area (acres): 341.27

Cut volume: 145,828.3 C.F., 5,401.05 C.Y.
Fill volume: 17,271.4 C.F., 639.68 C.Y.
```

Step 13 (Material Quantities):

To report the material quantities, run the TakeOff->Material Quantities->Standard Report routine. The report includes the count, length, area and volume for each type of material that was assigned for reporting in the Define Layer Target/Material/Subgrade command. The Material Quantities->Custom Report routine can be used to reporting these values with control of the report format and the option to export to Excel.


TakeOff Edit : C:\Program Files\Carlson TakeOff 2004\scadrprt.tmp
File
Edit
Settings
Open
Save
Print
Exit
Find
Screen
Hide

```
Material Quantities                                     10/18/2004 13:46

Material      Count  Length     Area(S.F.)   Volume(C.Y.)   Shrink   Depth   Cost
Pad           1      409.8      9315.9       345.0                   1.000
  Pad                                        345.0          1.000    1.000
Pavement      10     3100.8     56318.8      3128.8                  1.500
  Pavement                                   3128.8         1.000    1.500
```

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